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The main purpose of this research is to provide the commercial seafood industry of the Pacific Northwest information on preferences of restaurateurs, retailers, and wholesalers for whole albacore, low-value added albacore products (chunks, medallions, and steaks), albacore loins, and high-value added albacore products (hot smoked and lox). All of these products were categorized as non-traditional market forms of albacore products, except whole albacore. The empirical analysis was based on self explicated and conjoint analysis. The demand models for albacore products were estimated using weighted least squares. Profitability equations for albacore products were estimated using a two-limit Tobit model. From the self explicated section, it was found that the attributes of price, flavor, blood spots/bruising, and bleeding of whole albacore were considered highly important by respondents. From the conjoint analysis section, it was found that, as expected a

*priori*, price had a statistical significant effect on the demand and profitability models for all albacore products. Other variables, such as location of the firm, type of firm, experience with tuna species, and ranking of albacore had statistical significant effects on the demand and profitability equations. Wholesalers, restaurateurs, and retailers agreed that quality is a major concern and will influence their preferences when purchasing albacore products. Overall, the findings from this research can provide guidance to the commercial seafood industry of the Pacific Northwest to enhance the markets for albacore products.

# Demand and Profitability for Albacore Products: A Multi-attribute Analysis

by

Salvador Garcia-Martinez

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Signed by Victor J. Tremblay Dept Chair

Salvador Garcia-Martinez, Author

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With all my love

to

Maria Isabel

and

Chavita

# Demand and Profitability for Albacore Products: A Multi-attribute Analysis

## I. Introduction.

U.S. consumers generally believe that seafood products are highly nutritious. In spite of this, from 1970 to 1994, there have been both periodic increases and decreases in the U.S. per capita consumption of seafood and shellfish (Sylvia, 1992: Gorga and Ronsivally, 1988). The lowest U.S. level of per capita seafood consumption, 11.5 pounds of edible meat, occurred in 1971. In 1987, 16.2 pounds of edible meat accounted for the highest U.S. level of per capita consumption of seafood (USDC, 1996). During 1994, a record 3.94 billion pound nationwide consumption of seafood products occurred (Buck, 1995).

On average, U.S. seafood consumers ate, per capita, 13.3 pounds (edible meat) of fish and shellfish from 1970 to 1994. Increases in seafood consumption in the United States have been influenced by recognition and promotion of the health benefits related to seafood products, an increase in the average age of the population, increases in the production of aquaculture products, an increase in product promotion, and increases in the incomes of seafood consumers (Sylvia, 1992; Wallström and Wessells, 1994). From 1987 to 1992, the decrease in the U.S. per capita consumption of seafood was due to economic recessions in national and

global markets, a weak U.S. dollar, and concern over seafood safety due to pollution and seafood contamination (Sylvia, 1992; United States Department of Commerce, 1992-93).

Tuna has been a main part of the diet of U.S. seafood consumers throughout this period. The average annual per capita consumption of tuna products by U.S. consumers during the period 1970-94 was 2.97 pounds. This quantity represents a significant 22% of the average of fish and shellfish that U.S. citizens consumed per capita in the same period of time.

## I.1. Worldwide Tuna Markets.

Tuna fishery is an important activity worldwide (Garcia-Martinez, 1991; Medina, 1988). Due to the extensive research accomplished on tuna species they are considered "the best known open sea fish" worldwide (King, 1995; p. 56). These fish sustain the tuna industry in which canning is the main processing method. Today, fresh tuna (mainly yellowfin tuna) is available in the U.S. and is a highly regarded seafood product. Rawfish product known as sashimi and sushi, are important components in Japanese menus, and are also very popular in the United States (Doré, 1991).

In some European countries tunas are carefully butchered to obtain premium cuts (Doré, 1991). However, these premium cuts are not widely available in the U.S.

market. These cuts include steaks, fillets, boneless chunks, headless, dressed trunks, and slabs. Because fresh seafood products may be on ice for long periods of time before they are landed, frozen tuna might be a better product relative to unfrozen tuna (Doré, 1991).

The principal market tuna species are, in order of commercial importance due to volume landed, skipjack (Katsuwonus pelamis), yellowfin tuna (Thunnus albacores), albacore (Thunnus alalunga), bigeye (Thunnus obesus), southern bluefin tuna (Thunnus maccoyii), and northern bluefin tuna (Thunnus thynnus) (IATTC 1970-91; Panshin, 1971).

Among the seafood products that are purchased in the U.S., tunas are consumed in large quantities (Muangkoe, 1983). In fact, the main seafood product consumed in the U.S. is tuna (Seafood Business, 1989). For instance, in 1983 U.S. people consumed 35% of the world's tuna capture, while Japanese and European consumers both bought 24% of the tuna catch (King and Bateman, 1985). Most of this consumption is of canned tuna (Muangkoe, 1983) because this is the only tuna product form that the majority of the U.S. consumers have experienced (Seafood Business, 1989; Seafood Business, 1991). Fresh tuna sold to U.S. consumers represented, in 1989, less than five percent of the total tuna supply in the American market (Seafood Business, 1989).

Canned tuna is the main good produced in the world's tuna trade in which the United States is the main buyer. During 1983 U.S. purchasers consumed 57% of the total production of canned tuna while European and Japanese consumers bought 31.8% and 4% of this product, respectively (King and Bateman, 1985). The high quantity of canned tuna consumed in the U.S. makes this seafood product the most important in the American market (Wallström and Wessells, 1994).

## I.2. U.S. Canned Tuna Demand.

According to King and Bateman (1985), "canned tuna is the only seafood staple in the diet of most U.S. consumers (p.15)." In 1984, it was estimated that 70% of U.S. households included canned tuna as part of their supermarket purchases and during this year 53% of the U.S. retail seafood purchases was canned tuna. Because canned tuna is not oily, "not fishy," highly nutritious, easy to store, and easy to serve it appeals to U.S. palates. In addition, canned tuna is popular among U.S. consumers because 100% of the product is edible. On the contrary, only 36% of the weight of most beef products is consumable and only 41% of the weight of chicken is edible (King and Bateman, 1985).

From 1960 to 1984 tuna consumption in the U.S. has shown a generally upward trend, though not increasing

steady, from 2.0 pounds per capita in 1960 to 3.1 pounds per capita in 1984. Eighty percent of the consumption in the U.S. tuna market was "chunk light" tuna. Periodic declines in tuna consumption during this period were caused by specific events. For instance, a botulism scare (1962-63), the tuna/porpoise controversy (1975-78), and price decreases of tuna substitutes such as beef and poultry products (1982). From 1982 to 1984 per capita consumption of tuna increased due to imports of low cost canned tuna and due to drastic price cuts undertaken by U.S. producers (King and Bateman, 1985).

## I.3. Albacore in the U.S. Seafood Market.

Today, seafood consumers in the U.S. have developed sophisticated tastes and are conscious about the quality of the products that they eat. Albacore, which is one of the most prized member of the tuna family, could potentialy be a good candidate for seafood consumers looking for a high quality product (West Coast Fisheries Development, 1985). In 1983, the main consumers of albacore in the world were U.S. buyers whom eat about 70% of the world's albacore. France occupied the second place, while Spaniards were the third most important albacore consumers in the world (Muangkoe, 1983). In 1991, the world's highest quantities of albacore were purchased and consumed in the U.S. market (FAO, 1991).

Canned albacore is the best known albacore product in the U.S. while fresh and frozen albacore are relatively new products to U.S. consumers. In addition, because U.S. seafood consumers seem to favor the mild taste and white color of albacore, they pay the highest price for canned albacore (Muangkoe, 1983).

Albacore has several characteristics that may influence the decision of consumers when buying seafood and/or meat products. Albacore has lower levels of calories, cholesterol, fat, and sodium when compared with sirloin steak, pork loin chop and chicken breast. Contrary, the protein content of albacore is higher than these other meat products (West Coast Fisheries Development Foundation, 1985).

Albacore is considered one of the premium fish caught offshore the Pacific Northwest and is the only tuna species that can legally be labeled by canners as "white meat" (Hilderbrand, 1993; Doré, 1991). Jones (1958) stated that albacore tuna is widely accepted in Oregon and Washington because of its "distinct and savory flavor and it is one of Oregon's most well-liked products of the sea (p. 7)."

## I.4. Albacore Biogeography.

Tunas are pelagic fish that inhabit all the world's oceans (Doré, 1991). Albacore has a world wide distribution

and it is the basis of an important fishery along the western, central and north Pacific from late spring to early fall (Laurs and Lynn, 1977; Nishimoto, 1984; Doré, 1991; Childers and Miller, 1994; NMFS, 1996). Albacore tuna inhabit the temperate and sub-tropical areas of the world's oceans and is distributed from the surface to 150 m deep into the ocean (Blackburn, 1965; as cited by Panshin, 1971). In addition, albacore's distribution depends on the age of the fish (Laurs and Lynn, 1986).

There are two albacore stocks in the Pacific Ocean. The stock in the South Pacific is found from 5°S to 45°S and the stock of in the North Pacific is found from 10°N to 58°S (Blackburn, 1965 as cited by Panshin, 1971; NMFS, 1996). Albacore is not found between 10°N and 5°S (Yabe et al. 1963; as cited by Panshin, 1971). In fact, the Northern and Southern albacore stocks are genetically different (Yoshida and Otsu, 1963 as cited by Nishimoto; 1984). North Pacific albacore stock spawns in the central subtropical Pacific and migrates throughout the Pacific ocean (Laurs and Lynn, 1977).

Albacore are found from Baja California to the Gulf of Alaska "in the East and the equator to approximately 45°N in the West" (Yoshida and Otsu, 1963 as cited by Nishimoto, 1984; NMFS, 1996). Albacore's distribution is influenced by water temperature and feeding habits (Nishimoto, 1984).

I.5. Albacore Markets.

In 1985, if the salmon season was going poorly, salmon trollers would target albacore (West Coast Fisheries Development Foundation, 1985). After the decline in the 1980-1990's of salmon populations in the Pacific Northwest (National Research Council, 1995) there was a collapse of the coastal salmon fishery in Oregon and Washington. A number of fishermen abandoned the salmon fishery and focused much of their fishing efforts on albacore.

The harvesting sector of this industry faced problems due to the volatile nature of the albacore market (West Coast Fisheries Development Foundation, 1985). During the mid 1980s albacore canneries have been shut down throughout the Pacific Northwest. The closing of these canneries was caused by several economic factors. Some of the major West coast canneries (Bumble Bee, Van de Camp, and Starkist) reduced operations because the presence of imports of canned albacore not captured by U.S. vessels (West Coast Fisheries Development Foundation, 1985). This situation "practically annihilated the entire U.S. albacore fishery (Pacific Fishing, 1987; p.35)." Due to these conditions, commercial fishermen lost markets in this region. This represented a problem for commercial fishermen who must find other ways to sell their albacore catches (Hilderbrand, 1993).

According to Hilderbrand (1993), to solve this problem fishermen would need to sell albacore directly to the U.S. consumers and develop new market opportunities. In order to accomplish this it would be necessary to understand the preferences of consumers, restaurateurs, wholesalers, and retailers.

Albacore is available year-round as a frozen product. Supply availability of fresh albacore (fish that has never been frozen) is feasible when the fish are caught off the Pacific Northwest (50-300 miles) from July to early October by ice boats (West Coast Fisheries Development Foundation, 1985; Panshin, 1971; Doré, 1991).

Frozen albacore (brine frozen, blast frozen, or plate frozen) is available in seafood markets as skinless, boneless loins and as steaks. Conversely, the quantity supplied of fresh albacore is relatively. Fresh albacore is less preferred because there is the likelihood that it has been sitting in ice for too long and it may not be well cared for (Doré, 1991). Albacore is usually captured within 400 Km of the coast from central Baja California to British Columbia and this is the main reason behind bringing the fish back to land frozen (Nishimoto, 1984; Doré, 1991).

Fresh albacore products that can be found in the seafood market are loins and steaks. Fresh whole albacore is found trimmed, tail-off or on, and gutted. Frozen albacore

steaks and loins are found in the market and frozen whole albacore is sold trimmed, tail-off or on, and gutted. In addition, albacore is well suited for product diversification such as boneless steak and hot smoked (Seafood Business, 1994).

I.6. Alternative Marketing for Albacore.

From 1985 to 1986 the Western Fish Boat Association (WFBA) implemented the "Albacore Alternate Market Program" in an attempt to develop alternative porducts and markets for the West Coast albacore fishery (Sylvia, 1994; Lovel, 1995). From this program, WFBA obtained valuable information about the various sectors that constitute the albacore industry. One of the objectives of the market program was to analyze the responses of industry sectors to various frozen and fresh tuna products (Sylvia, 1994).

At the fishermen level, it was found that proper onboard handling of fish was indispensable in improving the quality of the fish harvested (West Coast Fisheries Development Foundation, 1995b). The priorities of the processor sector included changes in the cutting lines and training of the crew to loin, portion, and package albacore. It was determined that wholesalers and distributors required a better understanding of the quality characteristics of the albacore they were buying and selling. The food service and

retail sectors were encouraged to demand high quality albacore and to distinguish inferior albacore products. The Western Fish Boat Association found that it was essential to provide seafood consumers more information to educate them about alternate albacore products other than canned tuna (Sylvia, 1994).

In addition, in 1985 the West Coast Fisheries Development Foundation suggested that it was economically feasible for Oregon's fishermen to process quality albacore at sea. This feasibility was due to the ex-vessel price for quality whole albacore ($1.00/lb) in the Pacific Northwest seafood market. To date the price of frozen albacore loins, 3-5 pounds, without dark red meat, boneless, skin off, and packed in individual polywrap is between $2.60 and $2.70 per pound. Yellowfin tuna frozen loins with the same weight and characteristics is bought in the market at $1.80 and $1.90+ per pound. The price of albacore loins weighing 5 pounds an more ranges from $2.80/lb - $2.90/lb, while the price of yellowfin loins, 5-12 pounds and 12+ pounds, is between $1.80 and $1.90+ per pound (UBP, 1996).

### I.6.1. West Coast Non-canned Tuna Market.

In 1993, sectors of the West coast albacore industry were surveyed by telephone to identify the characteristics of the West coast non-canned tuna market. In spite of the

relative small number of firms interviewed, the data obtained provided useful information pertaining to this industry (Sylvia, 1994).

Fishermen, general processors, specialized processors, specialist seafood retailers acknowledged that albacore's major disadvantages were quality problems at the ex-vessel level and supply availability. Albacore was considered by some sectors an undeveloped opportunity in the non-canned tuna market, even though they believed it to be an excellent product. At the specialized processor level it was found that improvements in supply availability and quality would result in increases of production due to albacore's advantages over yellowfin tuna (Sylvia, 1994).

In 1994, members of the West coast seafood industry expressed once more the necessity to undertake additional research to investigate the potential development of the West coast albacore fishery. In response to this request a second attempt to redirect the development of this fishery began at the Coastal Oregon Marine Experiment Station, Mark O. Hatfield Marine Science Center at Oregon State University. It was thought that the implementation of the albacore fishery in this region might aid in the development of coastal communities (Sylvia, 1994).

This concern for albacore marketing reflects the importance that Oregon's commercial albacore fishery had

during the 1980 and early 1990s. In 1980, 3.5 million pounds of albacore were landed in Oregon, with an estimated value of 2.7 million dollars at the fisherman level. By the year 1990 2.1 million pounds of albacore were captured which had a value at the fisherman level of 1.66 million dollars. Oregon's albacore catch in 1992, 3.88 million pounds, had a value of 3.95 million dollars (Haynes 1994; Hreha, 1991; Lukas and Carter, 1994).

### I.6.2. Identification and Evaluation of New Albacore Product Forms.

Albacore in the can continues to be the main product form in the seafood market and it has a minimum need for quality control when compared to other product forms. Conversely, studies reveal that albacore is well suited for product diversification (Sylvia, 1994; Price and Melvin, 1989; Price and Melvin, 1994; Seafood Business, 1989-94; Seafood Leader, 1985). Price and Melvin (1994) believe that there is a variety of potential and important markets for albacore products. New albacore products might be successful in the non-canned tuna market because the increased commitment of the retail sector for fresh seafood products. In addition, some members of the retail sector perceive the potential for value added albacore products, for instance cold smoked albacore, in this market (Sylvia, 1994).

Overall, many sectors that encompass the albacore fishery recognize the potential. The West Coast Fisheries Development Foundation (1985) concluded that alternatives to the traditional processing and marketing methods for albacore are available. The introduction and development of non-traditional market forms of albacore (West Coast Fisheries Development Foundation, 1985) might produce benefits to the industry in the Pacific Northwest. These benefits could be achieved by the development of fresh, frozen, and value-added albacore products (Sylvia, 1994). The success of this development could be determined by an investigation of the demand for new albacore products in the U.S. seafood markets.

## I. 7. Methods of Analysis.

In order to identify respondent's preferences for a product and its characteristics Stated Preference and Choice (SPC) analysis can be used (Green and Rao, 1971). SPC analysis evaluate, quantitatively, levels of product attributes to respondent's preferences (Sylvia et al. 1995b). SPC models are often used in multi-attribute analysis of hypothetical products. SPC approaches include self explicated, conjoint, and hybrid analyses (Green and Srinivasan, 1990).

For this study, a self explicated utility analysis was performed to measure the relative importance of the attributes of the albacore products tested. This type of analysis is considered a value expectancy modeling approach (Rosenberg 1956).

A traditional conjoint analysis method was used in this research for several reasons. First, this is a sophisticated and useful technique to predict market and consumer attitudes and preferences among competitive multi-attributed products and services (Hu, 1996a; Novak, 1996; Smith, 1996; Green, 1984; Green and Rao, 1971; Green and Srinivasan, 1990). Second, under this experimental approach, products that are not currently in the market can be presented to respondents (Anderson and Bettencourt, 1993). Third, conjoint analysis allows respondents to test products, and not just individual characteristics (Laad and Zober, 1982) because it assumed that respondents make real world decisions based on several factors jointly (Hu, 1996b; Smith, 1996). Fourth, multiple observations are generated (Sylvia and Larkin, 1995) because each respondent is asked to evaluate a sample of profiles, or designs, for hypothetical products (Hu, 1996b; Novak, 1996; Smith, 1996). Finally, conjoint analysis has been successfully used in a variety of related settings, including food safety attributes (Baker and Crosbie, 1993); analysis of the

Pacific whiting fishery (Sylvia and Peters, 1991; Sylvia and Larkin, 1995); the quality of flounder, cod, and salmon (Anderson and Wessells, 1992); consumer demand for mussels (Brooks, 1993); seafood safety assurance (Wessells and Anderson, 1993); the fresh and frozen salmon market in New England (Anderson and Bettencourt, 1993); demand for wild and farmed salmon (Sylvia and Graham, 1992; Sylvia et al. 1995); seafood preferences (Anderson et al. 1994); seafood consumption (Wessells et al. 1994); and differences in quality and safety between wild-harvested products versus aquacultured products (Wessells et al. 1994).

Luce and Tukey (1964) initiated the use of conjoint analysis in their mathematical psychology research. Later, this method was widely applied to marketing research (Green and Rao, 1971; Green and Srinavasan, 1978). For instance, conjoint analysis applications have been used by marketers to test strategies to market and produce products (Green et al. 1981) and to understand the reaction of the market (Hu, 1996a).

To date, this choice simulation method enables researchers to evaluate the relationship between product attributes relative importance and customer preferences. Through the use of conjoint analysis, current products could be changed or new products are produced and consumer preferences are tested and forecasted in the market place

(Hu, 1996a; Hu, 1996b; Smith, 1996). At the end, this would result in a more efficient allocation of the firm's resources because researches will have information with regard to potential and profitable attributes of products (Hu, 1996b).

When testing both private business and public policy decisions, conjoint analysis has been used to predict the demand for products and choice behavior (Kroes and Sheldon, 1988; as cited by Sylvia and Larkin, 1995). Applications of conjoint research include non-market goods like air and water quality, game activities, fishing activities, evaluation of environmental amenities (Adamowicz et al. 1994; as cited by Sylvia and Larkin, 1995), family decision making, tourism, tax analysis, time management, medicine (Smith, 1996; Green and Srinivasan, 1978), and litigation (Green and Srinivasan, 1990).

To estimate the relative importance of the features of albacore products other than in the can conjoint analysis is used for both low-value added and high-value added albacore products.

The following sections describe the objectives of this research, the empirical framework, the experimental design, and the survey procedure. The detail of the model estimation and the results are then presented. The last section sumarized the findings and the potential applications.

## II. Objectives.

The main objective of this research is to provide to the Pacific Northwest seafood industry information on the preferences of restaurateurs, retailers, and wholesalers for non-traditional market forms of albacore products.

Specific objectives are:

1) Obtain empirical estimates of preferences for non-traditional albacore products by different market segments including restaurateurs, retailers, and wholesalers.

2) Determine, using empirical analysis, the preference for specific product characteristics by these different market segments.

3) Determine the utility (i.e. increased profits) that restaurateurs, retailers, and wholesalers may expect from the hypothetical albacore products used in this research.

4) Develop implications for production and marketing practices for the Pacific Northwest seafood industry.

# III. Empirical Framework.

## III.1. Self Explicated Utility Analysis.

Self explicated utility analysis is a procedure used for measuring utility functions (Huber, Shaney and Ford 1969; Huber 1974; as cited by Green et al 1981). For this analysis, first, a number of $J$ attribute's product are shown to a respondent who rates the relative importance of those attributes. A numerical scale ranging from not important to very important is used for this rating.

The second step consists of showing the respondent, one at a time, $J$ sets of attribute levels. The respondent is asked to rate each attribute level, using a point scale, in terms of the desirability for that level of the attribute. This scale ranges from "very undesirable" to "very desirable" in which a mid-level score (often zero), indicates indifference. The importance score of the $J$ attribute is multiplied by the desirability score of the $J$ attribute levels. The following additive model, following Green et. al. 1981, measures the self explicated utility of the respondent to the $h^{th}$ stimulus profile:

$$U_h = \sum_{j=1}^{J} w_j \, u_{ij}^{(h)} \qquad (1)$$

$U_h$ is the total utility of the choice $h$, $w_j$ represents the self explicated importance weight for attribute $j$, and $u_{ij}^{(h)}$ represents that choice $h$ has "a desirability score of $u$ on level $i$ of attribute $j$" (Green et al. 1981).

III.2. Conjoint Analysis.

The heterogeneity and differentiation of seafood products are factors that suggest that the application of traditional demand analysis to assess seafood buyers' behavior may be inadequate. Traditional demand models require the following assumptions to hold: (a) Homogeneous products; (b) accurate knowledge of prices; (c) accurate knowledge of quantities demanded; and (d) buyers with perfect information pertaining to the products which they are purchasing (Anderson and Bettencourt, 1993). Overall, these assumptions are violated for seafood products in general and albacore products in particular.

Instead of using traditional demand analysis, conjoint analysis is used because, through field experiments, preference or utility (the dependent variable) is measured. Under this method, the main assumption is that utility is a function of the attributes of the product(s) tested. In addition, the likelihood of strategic behavior is diminished by using preference instead of the assignation of a dollar

value to the products tested (Anderson and Bettencourt, 1993).

A decompositional approach is utilized in traditional conjoint analysis models. Under this approach, composite hypothetical products are created from an attribute set and respondents rank their preference for those products (Hu, 1996a; Smith, 1996; Anderson and Bettencourt, 1993; Green and Srinivasan, 1978).

The advantages of the experimental approach in conjoint methods are: (1) Conjoint analysis allows the analysis of heterogeneous goods (such as albacore products); (2) proper experimental design will assure the orthogonality of the attributes of products (Anderson and Bettencourt, 1993; Green and Srinivasan, 1978); (3) forecasting of products not present in the market; (4) avoidance of simultaneity of variables; and (5) reduction of the likelihood of strategic behavior (Anderson and Bettencourt, 1993).

The high cost of development and execution, reduced number of composite products tested by respondent, and lack of accuracy to reflect real market situations are all disadvantages and weaknesses of the conjoint analysis method. Proper design of field experiments will improve the accuracy to reflect real market situations and increase the number of composite products to be tested (Anderson and Bettencourt, 1993).

III.3. Preference Model Development.

According to Lancaster (1971) the utility that consumers obtain when choosing a product depends, in theory, directly on the attributes of the product and the attribute's levels. This utility is indirectly a function of the profit that the firm expects to obtain when utilizing a product.

Following Anderson and Bettencourt (1993) and Sylvia and Larkin (1995) the general form of the quasi-concave, twice continuously differentiable utility function derived from the use of a product can be expressed as:

$$U(A_h) = U\{E[\Pi_h(\mathbf{x}_h, p_h)]; \mathbf{x}_h\} \qquad (2)$$

An evaluation of this utility function is accomplished when conjoint analysis is performed (Anderson and Bettencourt, 1993). $U(A_h)$ is the preference (or utility) that each respondent obtains from each albacore product $A_h$, $\mathbf{x}_h$ is a vector of levels that represent each albacore product, price for each albacore product is represented by $p_h$, and the profit that each firm expects to obtain is written as $E[\Pi_h(\mathbf{x}_h, p_h)]$. Under this scheme, price will influence the firm's profit and, therefore, take part of the utility function described in equation (1).

Instead of combining self explicated weights with conjoint analysis we used a "two" stage conjoint analysis. Under this approach the first stage includes data from the self explicated section of the survey. These data are the actual scores and not the weghted mean scores described in equation one. The second stage is the conjoint analysis. Under the assumption that utility is additive in the attribute levels (Akkaa and Korgaonkar, 1983; Jain et al. 1979; Green and Snrinivasan, 1978) the representation of the utility's two stage systematic component is as follows:

$$U(A_h) = \beta_o + \sum_{k}^{K} \beta_k S_k + \sum_{j=1}^{J_o} \sum_{i=1}^{I} \beta_{ij} D_{ij}^h + \sum_{j=J_o+1}^{J} \beta_j X_j^h + \varepsilon_h \qquad (3)$$

The term $\sum_{k}^{K} \beta_k S_k$ represents the first component of the model and the conjoint analysis component is represented by the terms $\sum_{j=1}^{J_o} \sum_{i=1}^{I} \beta_{ij} D_{ij}^h$ and $\sum_{j=J_o+1}^{J} \beta_j X_j^h$ which indicate the contractual and firm characteristics. The total number of attributes is *J-K*. K represent the attributes included in the first component in equation three. Dummy variables, $D_{ij}^h$, are included in the subset $J_o$. Continuous attribute variables, $X_j^h$, are contained in the subset $J$ - $J_o$. All variables are associated with attributes and levels which are indexed as $j$ and $i$ respectively. Fixed albacore

attributes also influence respondents utility and this effect is reflected in parameter $\beta_o$. "The remaining parameters indicate the relative contribution of each attribute level utility, or preference, for profile h" (Sylvia and Larkin 1995, p. 506).

In order to include interactions among attributes, and between attribute and respondent characteristics variables in the conjoint analysis a model proposed by Akeeh and Korgaonkar (1983) and Chakraborty et al. (1992 as cited by Sylvia and Larkin, 1995) is defined. The interactions chosen are represented by the additional component $A_{ijk}^h$ in the following model:

$$U(A_h) = \beta_o + \sum_{k}^{K} \beta_k S_k + \sum_{j=1}^{J_o} \sum_{i=1}^{I} \beta_{ij} D_{ij}^h + \sum_{j=J_o+1}^{J} \beta_j X_j^h + \sum_{j=1}^{J} \sum_{k=j}^{J} \sum_{i=1}^{I} \beta_{ijk} A_{ijk}^h + \varepsilon_h \quad (4)$$

The interaction analyzed in this research is between price and firm sector. This interaction was included because, within the distribution chain, firms have distinct positions and it is *a priori* believed that those firms face different prices due to marketing margins (Sylvia and Larkin 1995). In addition, in other seafood studies it was found that this interaction is highly significant (Halbrendt et al. 1991).

## IV. Experimental Design and Survey Procedure.

The goals of the albacore survey were to generate information in the following four areas: First, the knowledge of respondents regarding tuna and albacore; second, respondents belief in potential of albacore products in seafood market; third, respondent preferences for the attributes of specific albacore products they selected using self-explicated utility analysis; and fourth, respondents preferences for eight hypothetical albacore products using conjoint analysis.

Industry research, consumer interviews and literature review allowed us to develop, for eight albacore products, a list of attributes considered relevant for the self explicated experiment (Table 1) and the conjoint analysis experiment (Tables 2 and 3).

In the self-explicated section, the respondent was asked to rate the relative importance of each attribute for the albacore products using a 7 point scale from "not important" (zero) to "very important" (seven). In order to give a score of the desirability for the albacore's attribute levels respondents used a 9 point scale ranging from " very undesirable" (-4) to "very desirable" (+4) with a mid-way score of zero indicating that the attribute level was "neither strongly desired or undesired". Attribute

importance scores were multiplied by the desirability scores of attribute levels to calculate the overall importance of each attribute characteristic.

In the conjoint analysis section, and for each albacore product used in the survey, eight hypothetical products were created using an asymmetrical fractional factorial method. Under this method orthogonality is imposed between the attribute levels (Breton-Clark, 1987). During the conjoint experiment a full-profile method (Green and Rao, 1971) was used. Each respondent evaluated eight profiles, presented as cards, of the albacore product she/he preferred the most and were required to stipulate the quantity in pounds (open-ended question) they would purchase per week. Respondents were asked to rate the degree of potential profitability of handling each alternative albacore product using a cardinal scale. A "highly unprofitable" albacore product received a rating of -11 and a "highly profitable" albacore product was rated at +11. The break even point of a firm was represented by the score zero. Because price for all albacore products is included in each profile the answers from each firm reflects price sensibility (Sylvia and Larkin, 1995).

## IV.1. Albacore Products Used in the Survey.

For this research albacore captured by Oregon fishermen were processed (February 23-28, 1995) at the Hatfield Marine

Science Center (Newport, Oregon). Whole albacore (picture), low value-added (frozen) and high value-added (cooked) albacore products were presented to wholesalers, retailers, and restaurateurs in several cities in Washington, Oregon, California, New York, New Jersey, and Illinois. Low value-added frozen albacore included chunks, loins, steaks, and medallions. High value-added were presented to firms as albacore lox, hot smoked albacore, and albacore loaf.

IV.2. Data Collection.

A random sample of wholesalers, retailers and restaurateurs were contacted by phone and were requested in-person interviews for the survey. Information about the albacore fishery and the Oregon albacore industry was mailed to those entrepreneurs interested in the survey (Appendix C).

A team of four surveyors took samples of all the albacore products and conducted in-person interviews in cities in New York (March 7-11, 1995), Chicago (March 14-18, 1995), California (March 21-25, 1995). One interviewer conducted surveys in Oregon and Washington during May the same year. During the survey a picture of a whole albacore fish was presented because it was not possible to have a real sample for this kind of albacore product. Even though sashimi made with albacore was not presented to the

participants they were asked to express their beliefs about this product.

IV.3. Demographic Profile of Survey Respondents.

A total of 87 surveys were conducted in California (20%), Illinois (25%), New Jersey (1%), New York (22%), Oregon (10%), and Washington (20%). There are 2 surveys without locality (2%). In California, Los Angeles was the city with the highest number of surveys conducted.

Most of the surveys made in Illinois were conducted in Chicago while in the state of New York the majority of the surveys were implemented in New York city. For the state of Oregon, seven of the firms interviewed were located in Portland, while in Washington ten firms were surveyed, all in Seattle (Table 4). The specific firms targeted for the survey were restaurants (41.4%), wholesalers (32.2%), and retailers (18.4%). Seven firms included one purchaser for hospitals, one retirement home, one store chain, one supermarket chain, one smoke house, and a trader (Table 5).

IV.4. Respondent's Demographics.

Respondent information obtained from the survey included years of experience in seafood business, seafood industry sector from which the respondent purchases tuna

products, annual revenues generated by the firm, seafood products handled by the firm, and the function of the firm in the seafood market. It was assumed a priori that purchasing preferences were affected by the former descriptors (Sylvia and Larkin, 1995). Firms were identified by:

- their geographic location
- annual revenues generated from seafood sales
- their primary function.

Geographic location was included as an explanatory variable and firms were separated in three regions. The East coast region (defined as EAST=1) included firms from New York, and New Jersey. The West coast region (defined as WEST=1) covered California and Washington, and companies from Oregon comprise the region Oregon (defined as OREGON=1).

Information from the annual revenues question allowed the separation of firms into two groups. Firms with revenues between 50-100 million dollars per year and annual revenues greater than 100 million dollars were included in the category large. Firms were given the category of "first receiver" or "second receiver." A company was classified as "first receiver" if it bought seafood products directly from processors or importers. In general, wholesalers and secondary processors belong to this category. "Secondary

receivers" were those firms that acquire seafood products from "first receivers." Restaurants, retailers, and exporters were included into this category (Sylvia and Larkin, 1995).

Under this type of grouping, 50% of the firms interested in albacore chunks and 68% of the firms in albacore loins were second receivers. The category "second receiver" comprised 86% of the firms that preferred albacore medallions and 71% of those companies interested in albacore steaks. Sixty percent of businesses attracted to whole albacore were classified as second receivers. Conversely, 17% of the firms interested in hot smoked albacore and 33% of the firms responsive to albacore lox were identified as first receivers.

# V. Results.

## V.1. Self Explicated Analysis.

For the self explicated section of the albacore survey, the mean scores of the attributes of the albacore products were analyzed to test for significant diferences (Wannacott and Wannacott, 1977). In addition, the sum of the weighted mean scores (the importance score of the attribute multiplied by the desirability score) was used to compare the preferences of first receivers and second receivers when they were asked to select their most preferred and second most preferred albacore products. The total score, or sum of the weighted scores, is determined by all product attributes. Different combinations of product attributes determine specific total scores which might be useful when comparing, relatively, the respondent's desirability of the albacore products presented in the survey. For instance, a big difference between the total score for the most preferred albacore product, i.e. 400 units, and the total score for the second most preferred albacore product, i.e. -20 units, indicates a very low desirability for the second choice. An albacore product with negative total score indicates that respondents had a relative negative desirability for that

particular product. Small differences between total scores denote similar desirability for both products.

### V.1.1. Relative Importance of Whole Albacore Attributes.

Twenty firms preferred this product. Odor was the attribute with the highest mean score. There was no significant difference between the mean score of odor and the attributes flavor, bled, price. There was a significant difference between the mean score of odor and the mean scores of shelf life thawed chilled, bruises on skin, glazing, shelf life frozen, product uniformity, skin condition, supply availability, viscera present, skin color thawed, market support, fins and tail, and head (Figure 1; Table 6).

Second receivers gave a total score of 286.3 points to the whole albacore product they preferred the most. On the contrary, 250.3 points was the total score first receivers assigned to the whole albacore product they believed had the highest rated characteristics. There was a difference of 36 points between first receivers and second receivers when they were rating their most preferred whole albacore product. Both first and second receivers gave a negative total score to the whole albacore product to which they gave the second highest rated characteristics.

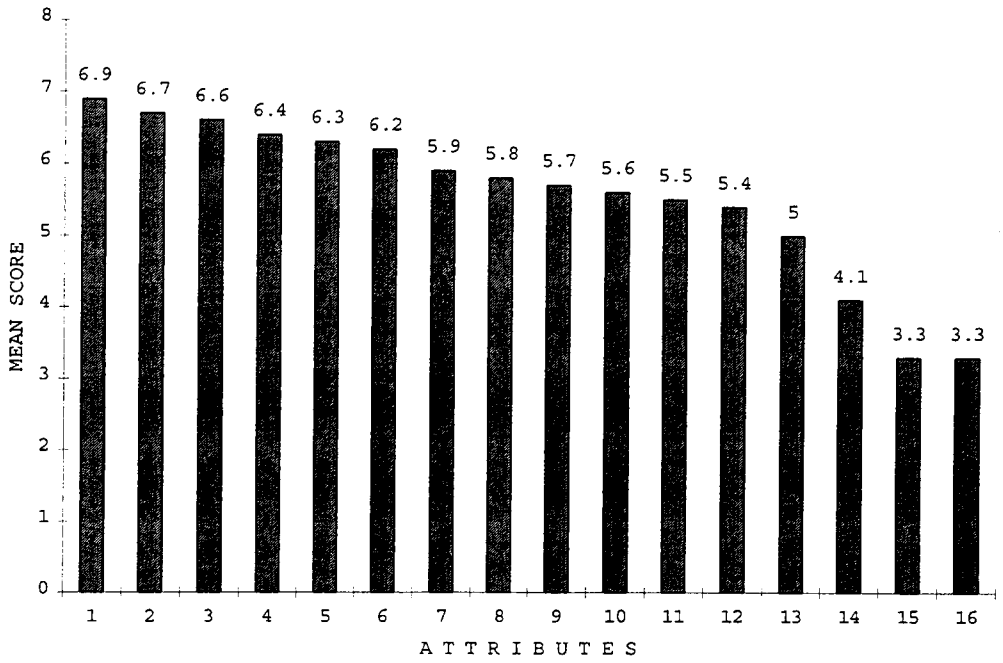


Figure 1. Relative importance for whole albacore attributes.

1. Odor
2. Flavor
3. Bled
4. Price
5. Shelf life thawed chilled
6. Bruises on skin
7. Glazing
8. Shelf life frozen
9. Product uniformity
10. Skin condition
11. Supply availability
12. Viscera present
13. Skin color thawed
14. Market support
15. Fins and tail
16. Head

First receivers assigned a score of -38.1 points while second receivers gave a score of -17.1 points (Table 6).

### V.1.2. Relative Importance of Albacore Chunks Attributes.

Albacore chunks were preferred over all other albacore by only four firms. Flavor, with mean score 6.8, was attribute with the highest score. There was no significant difference between the mean score of flavor and the mean scores of the attributes shelf life chilled unpacked, price, blood spots/bruising, flesh color, odor, and supply availability. The mean scores of glazing, market support, presence of dark red flesh, size and dimensions, origin on fish, product uniformity, shelf life frozen, texture, and packaging were significantly different from the mean score for flavor. Packaging received the lowest mean score (4.3) among all attributes for this product (Figure 2; Table 6).

The most preferred albacore chunk product was given a total score of 312 points by first receivers. There was a difference of about 50% when compared to the maximum total score assigned by second receivers to the product they gave their highest total score (153.5 points). Both first and second receivers gave low total scores to the characteristics of their second most preferred albacore chunks product, 14.5 points and -46.5 points respectively (Table 6).

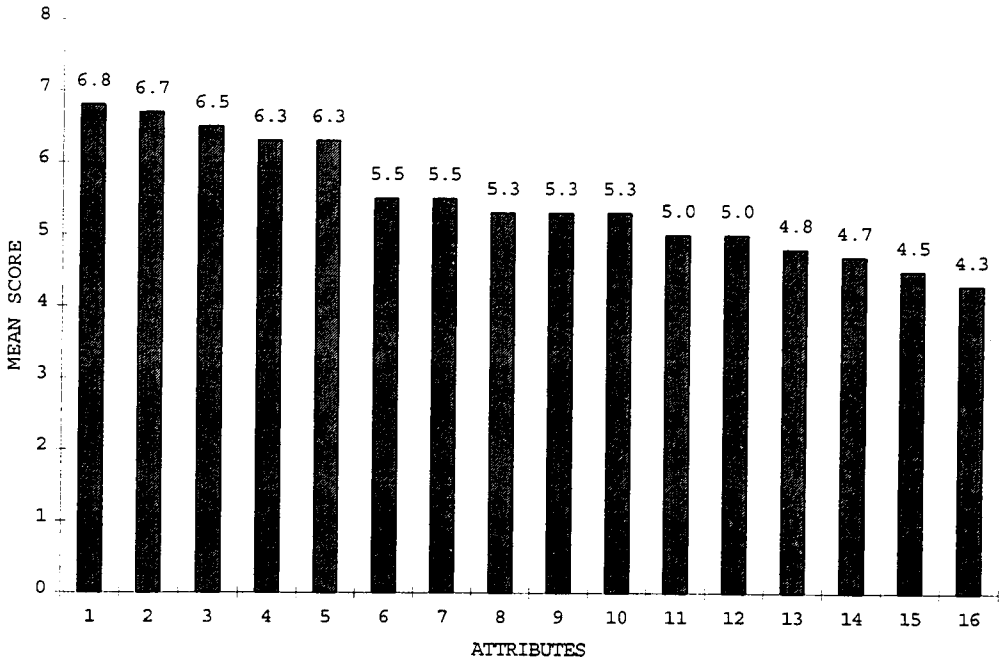


Figure 2. Relative importance for albacore chunks attributes.

1. Flavor
2. Shelf life chilled unpacked
3. Price
4. Flesh color
5. Blood spots/bruising
6. Odor
7. Supply availability
8. Glazing
9. Market support
10. Presence of dark red flesh
11. Origin on fish
12. Size and dimensions
13. Product uniformity
14. Shelf life frozen
15. Texture
16. Packaging

V.1.3. Relative Importance of Albacore Loins Attributes.

The highest mean score, 6.7 points, was received by the attribute flavor (Figure 3; Table 6). No significant

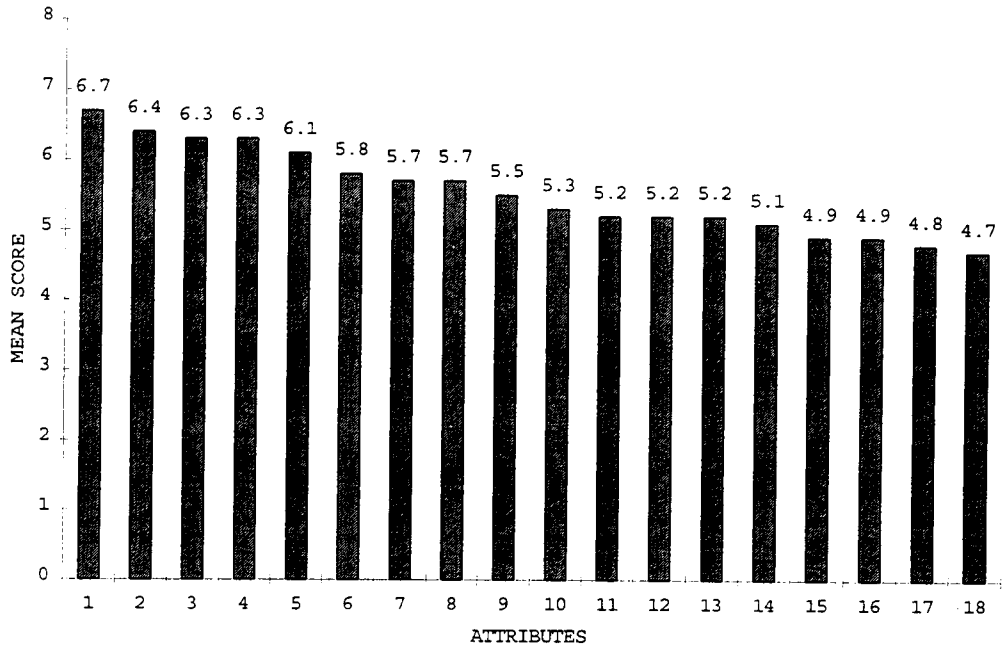


Figure 3. Relative importance for albacore loins attributes.

1. Flavor
2. Odor (thawed)
3. Presence of dark red flesh
4. Texture
5. Bruising/blood spots
6. Shelf life chilled packed thawed
7. Flesh color
8. Product uniformity
9. Shelf life frozen
10. Shelf life chilled unpacked thawed
11. Bones present
12. Cuts and tears
13. Glazing
14. Supply availability
15. Belly meat
16. Packaging
17. Market support
18. Price

difference between the mean scores of flavor and odor, presence of dark red flesh, and texture was found. On the contrary, the mean scores of the attributes bruising/blood spots, shelf life chilled packed thawed, product uniformity, flesh color, shelf life frozen, shelf life

chilled unpacked thawed, bones present, cuts and tears, glazing, supply availability, belly meat, packaging, market support, and price were significantly different from the mean score for flavor. Surprisingly, the lowest mean score, 4.7 points, was received by the price attribute (Figure 3; Table 6).

There was a difference of 12.1 points between the total scores of first receivers (286.8 points) and second receivers (274.7 points) when choosing the product with the highest rated characteristics. First receivers gave a total score of 56 points to the product they perceived had the second highest rated characteristics while first receivers gave it a total score of 11.1 points (Table 6).

### V.1.4. Relative Importance of Albacore Medallions Attributes.

The results indicated that the attributes for albacore medallions that received the highest scores, both with mean scores of 6.9 points, were bruising/blood spots and flavor (Figure 4; Table 6). No significant differences between the mean scores for these two attributes and the mean scores of the attributes flesh color, odor, presence of dark red flesh, texture, shelf life thawed packed, shelf life thawed unpacked, glazing, shelf life frozen and product uniformity

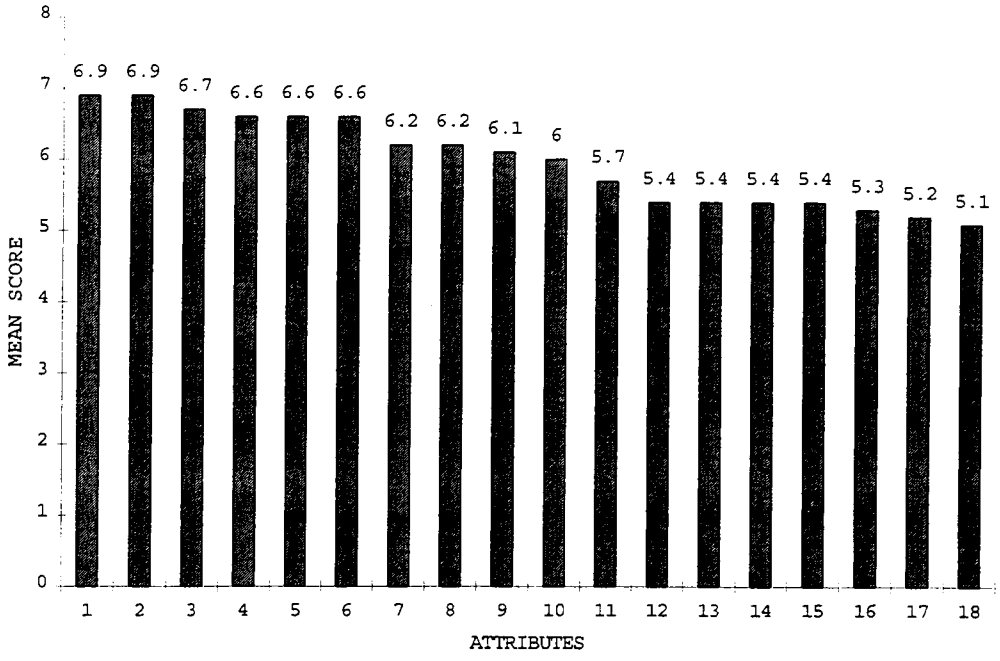


Figure 4. Relative importance for albacore medallions attributes.

1. Bruising/blood spots
2. Flavor
3. Flesh color
4. Odor (thawed)
5. Presence of dark red flesh
6. Texture
7. Shelf life thawed packed
8. Shelf life thawed unpacked
9. Glazing
10. Shelf life frozen
11. Product uniformity
12. Dimensions
13. Price
14. Supply availability
15. Thickness
16. Packaging
17. Belly meat
18. Market support

were found (Figure 4; Table 6). On the contrary, significant differences between the mean scores of bruising/blood spots and flavor and the mean scores of

price, dimensions, supply availability, thickness, packaging, belly meat and market support were found. Respondents gave a mean score of 5.1 to the albacore medallion attribute market support which made it the least important attribute for this albacore product (Figure 4; Table 6). Second receivers generated a total score of 309.1 points and 75.8 points to their most preferred and second most preferred albacore medallion product respectively. First receivers gave a total score of 307 points to the albacore medallion product they preferred the most and a negative total score to the product they perceived as second most preferred (Table 6).

### V.1.5. Relative Importance of Albacore Steaks Attributes.

Seven respondents gave to the attribute bruising/blood spots the highest mean score (6.7 points) when rating the attributes of albacore steaks (Figure 5; Table 6). No significant differences were found between the mean score of this attribute and the attributes flavor, odor, price, skin, thickness, flesh color, dimensions, glazing, product uniformity, texture, shelf life chilled unpacked thawed, shelf life chilled packed thawed, and packaging. Significant differences were found between the

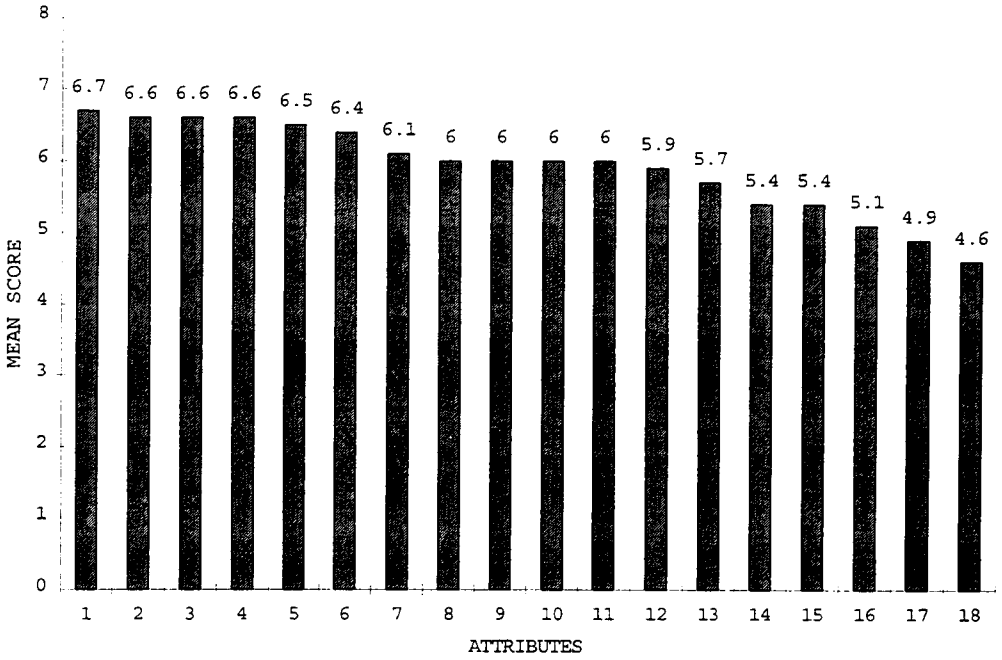


Figure 5. Relative importance for albacore steaks attributes.

1. Bruising/blood spots
2. Flavor
3. Odor (thawed)
4. Price
5. Skin
6. Thickness
7. Flesh color
8. Dimensions
9. Glazing
10. Product uniformity
11. Texture
12. Shelf life chilled unpacked thawed
13. Shelf life chilled packed thawed
14. Packaging
15. Supply availability
16. Belly meat
17. Market support
18. Shelf life frozen

mean score of this attribute and the attributes flavor, odor, price, skin, thickness, flesh color, dimensions, glazing, product uniformity, texture, shelf life chilled

unpacked thawed, shelf life chilled packed thawed, and packaging. Significant differences were found between the mean score of the attribute bruising/blood spots and the attributes supply availability, belly meat, market support, and shelf life frozen. The lowest mean score, 4.6 points, was received by the attribute shelf life frozen (Figure 5; Table 6). Second receivers assigned a total score of 358.6 points to the albacore steak product they preferred the most while second receivers assigned a total score of 287.5 points. Second receivers gave to their second most preferred steak product a total score of 138 points and first receivers gave to this product a total score of -12 points. When we compare the total score given by second receivers to albacore steaks with the total scores of the products used during the survey, it is evident that albacore steaks received the highest total score among all products by this group of respondents. This might indicate that, overall, the attributes and levels of albacore steaks used during the survey correspond to the preferences of retailers and restaurateurs.

### V.1.6. Relative Importance of Hot Smoked Albacore Attributes.

Color and packaging were given the highest mean scores, both with 5.8 points (Figure 6; Table 6). No

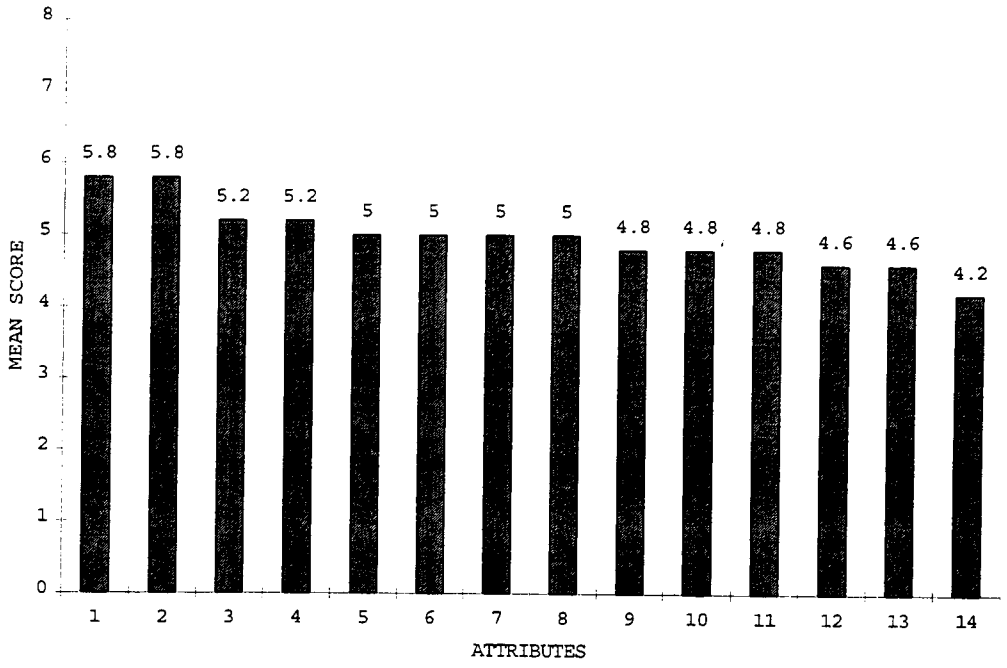


Figure 6. Relative importance for hot smoked albacore attributes.

1. Color
2. Packaging
3. Moistness
4. Price
5. Product uniformity
6. Product size
7. Shelf life thawed unpacked
8. Supply availability
9. Marinade intensity
10. Market support
11. Texture
12. Shelf life frozen
13. Shelf life thawed vacuumed
14. Type of smoke

significant differences were found between the mean scores of these two attributes and the attributes moistness, price, product size, shelf life thawed unpacked, supply availability, marinade intensity, market support, texture, shelf life frozen, shelf life thawed vacuumed, and type of smoke. The lowest mean score, 4.2 points, was assigned to

the attribute type of smoke (Figure 6; Table 6).There was a difference of 36 points between the total score assigned by second receivers to their most preferred hot smoked albacore product (194 points) and the total score (158 points) that first receivers gave to the same type of product. Second receivers gave a total score of 89.5 points to the product they believed had the second highest rated characteristics while first receivers assigned a total score of -16 points to their second choice for hot smoked albacore (Table 6). First receivers preferred albacore products of low-value added instead of high-value (cooked) products.

### V.1.7. Relative Importance of Albacore Lox Attributes.

With a mean score of 6.9 points, respondents gave to the attribute flavor the highest score for albacore lox. No significant differences were found between the mean score for flavor and the attributes price, texture, color, and shelf life thawed packed chilled (Figure 7; Table 6). On the contrary, significant differences between the mean score for flavor and the mean scores of the attributes product uniformity, shelf life frozen, supply availability, market support, package, packaging, slice thickness, coloring, shelf life thawed unpacked chilled, oil content,

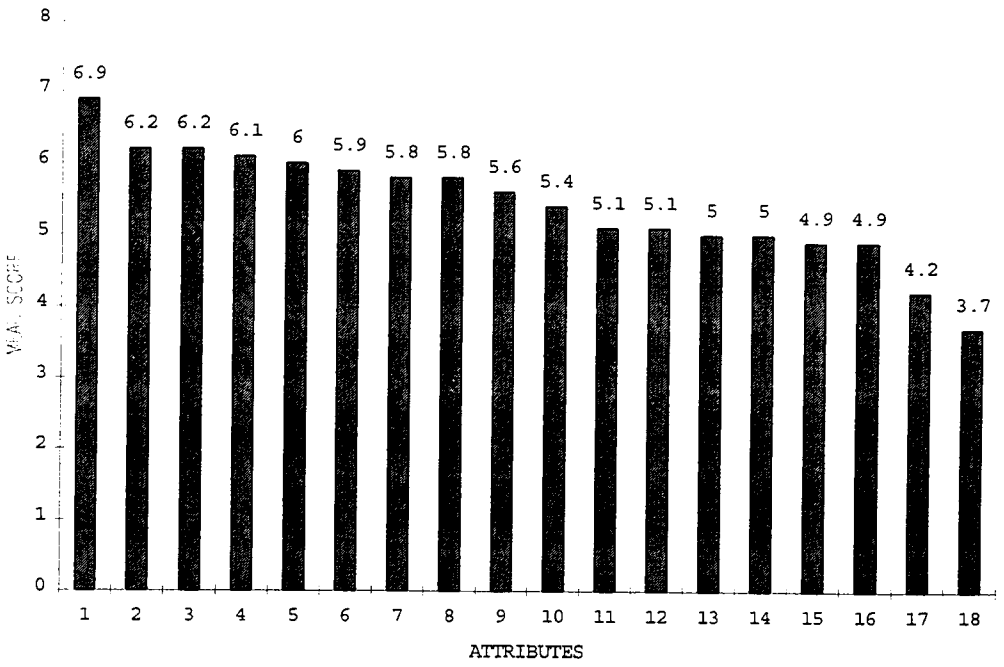


Figure 7. Relative importance for albacore lox attributes.

1. Flavor
2. Price
3. Texture
4. Color
5. Shelf life thawed packed chilled
6. Product uniformity
7. Shelf life frozen
8. Supply availability
9. Market support
10. Package
11. Packaging
12. Slice thickness
13. Coloring (dye)
14. Shelf life thawed unpacked chilled
15. Oil content
16. Slice dimensions
17. Salt content
18. Slice/package

found. Slice/package was the attribute with the lowest mean score (3.7 points) among all the characteristics of this albacore product (Figure 7; Table 6).

First receivers gave to their highest rated albacore lox product a total score of 235.2 points while second receivers gave to their most preferred albacore lox product a total score of 294.4 points. First receivers and second receivers assigned a positive total score, 93.5 points and 136.6 points respectively, to the albacore lox product that they perceived had the second highest rated characteristics (Table 6).

V.1.8. Summary.

Findings from the self explicated analysis section might be important for the Pacific Northwest seafood industry when developing products and marketing strategies for albacore and to improve the quality of the albacore products they offer. There are significant implications from this analysis of the mean scores of the albacore product attributes used in this survey.

Price was highly or moderately important for all albacore products except for albacore loins. Albacore flavor stands out as consistently important for respondents. This implies that factors that might affect negatively flavor, such as improper storage and handling, should be avoided to increase albacore product's quality and to influence positively respondent's behavior. For all of the low-value added albacore products, respondents

perceived the attribute blood spots/bruising as highly important. This finding suggests that fishermen's improvement in the handling of fish to avoid bruising would influence positively the preferences of buyers. Bleeding of whole albacore was considered highly important. Fishermen could take into account the correlation that might exist between this attribute and the reduction of the undesirable blood spots present in the albacore products. Market support was, among albacore products, an attribute of low importance to respondents except for albacore chunks and albacore lox in which it was perceived as an attribute of moderate importance.

Overall, the results suggest that steps toward improving the quality of albacore products may be an effective means of enhancing the market prospects for albacore.

The attributes of the albacore products tested had several levels. Figures were prepared, for each level, to compare the relative desirability differences between first receivers and second receivers (Appendix A).

V.2. Conjoint Analysis.

This analysis provided information on the firm characteristics and albacore product attributes that are important determinants of the demand for, and profitability

of, albacore products. Demand models were estimated using weighted least squares to correct for heteroskedasticity. Profitability models were estimated using a two-limit Tobit model to avoid bias caused by the outlier profitability values +11 and -11 (Greene, 1992; Chapter 44).

V.2.1. Whole Albacore.

Variables found to have statistically significant effects ($\alpha \leq .05$) on product demand were WSALER, REST, EXPALBAC, RANKALB, WESTZONE, OREGON, and PRICEWH. PRICE was statistically significant ($\alpha \leq .10$) (Table 7).

The price coefficient PRICE, ceteris paribus, indicates that one dollar decrease in price increased demand by about 282 pounds per week. The coefficient of PRICEWH suggests that wholesalers are more sensitive to price because these types of firms expect to buy and sell at lower prices due to their ability to purchase large volumes of product (Table 7).

The negative coefficients for EASTZONE, WESTZONE and OREGON suggest that firms demanding the largest amount of whole albacore were located in Illinois (Table 7).

The coefficient for WSALER is large and highly significant (t=10.53). It indicates that, ceteris paribus, wholesalers will purchase 6,207 more pounds per week of whole albacore than retailers. Conversely, the highly

significant coefficient of REST shows that restaurateurs buy about 2745 less pounds per week of whole albacore than retailers (Table 7).

The coefficients for EXPTUNA and EXPALBAC show significant effects on demand for whole albacore. Firms with high experience with tunas demand 726 pounds less per week of whole albacore than firms with moderate and no experience with tunas. Similarly, firms that have high experience with whole albacore would purchase 2643 less pounds per week than businesses with low and moderate experience with whole albacore (Table 7).

The coefficient for SAFETY, not significant, shows that firms applying the HACCP FDA mandatory program will demand about 361 more pounds per week than firms comfortable with the safety program offered by their supplier (Table 7).

Factors found to have a statistically significant effect on profitability were PRICE, REST, EXPTUNA, EXPALBAC, RANKALBA, EASTZONE, WESTZONE, and OREGON.

As expected a priori, PRICE coefficient indicates a highly significant negative relationship between price and profitability of whole albacore. A one unit increase in price reduced profitability by 4.2 points. Even though the coefficient for PRICEWH is not significant it indicates

greater price sensitivity of wholesalers when selling large amounts of whole albacore (Table 8).

The three variables representing location of firms had significant positive effects on profitability. Coefficients of EASTZONE, WESTZONE, and OREGON suggest that firms from these locations have a larger profitability (11.7, 10, and 14.5 points respectively) than firms located in Illinois (Table 8).

The variable REST, with a highly significant coefficient, shows that restaurateurs expect a profitability level 19.6 units higher than retailers from whole albacore product. The coefficient for WSALER was also positive, but not significant (Table 8).

Firms with high experience with tunas expect a lower profitability level, about 8.3 units, than firms with moderate or no experience with tunas. The coefficient for RANKALBA is large and highly significant (t=10.06) indicating that firms that ranked whole albacore above other tunas will have a profitability level 20.6 units higher than firms that gave this product a lower rank (Table 8).

All three location variables (EASTZONE, WESTZONE, and OREGON) were highly significant and with profitability levels about 10 units higher than the profitability level of firms from Illinois (Table 8).

The variable SAFETY, with a coefficent not significant, shows that firms expect the HACCP program to increase their profitability levels 1.7 units more than the firms that get the traditional safety program from their suppliers (Table 8).

If fishermen want to increase the demand for whole albacore, they might consider the estimation results which show that firms are sensitive to price. In particular, firms from the wholesaler sector demanded larger quantities of whole albacore, firms located in Illinois have a greater demand for whole albacore. The quality of albacore products that fishermen could offer is fundamental to influence buyer's preferences. Low quality products might result in unfavorable experiences with albacore and this could influence entrepreneurs with knowledge on tuna species to demand less of this product. One of the most important objectives of the marketing strategy for whole albacore is to provide a product with attributes that will change the perception that they have regarding whole albacore.

Firm's profitability is influenced by changes in price with wholesalers especially price responsive. Because restaurateurs expect high profit levels when selling whole albacore, fishermen might try to explore market strategies directed to this sector of the fishing industry. Seafood businessmen with high experience with tunas and albacore

expect lower profitability from whole albacore which might indicate they prefer other types of tunas (i.e. yellowfin). One industry strategy would be to promote whole albacore and emphasize its attributes given the high ranking this product received when compared to other types of tunas.

V.2.2. Low-value Added Albacore Products.

Albacore products included in this category were chunks, medallions, and steaks. These products were put in the same category due to some common attributes, especially PRICE. Variables with statistically significant effects ($\alpha \leq .05$) on product demand were PRICE, PRICEWH, and OREGON.

PRICE and PRICEWH behave as expected. A one unit increase in price decreased the quantity of low-value added albacore products demanded by 93.5 pound per week. Wholesalers' demands, due to the large volume of seafood products they sell and buy, are even more price sensitive. A one dollar increase in price results in a predicted decrease of 93.5 pounds in quantity demanded.

The only finding of a significant effect of geographic location on the demand for low-value added albacore products was for OREGON. Firms from Oregon would potentialy purchase 2,967 more pounds per week than firms located in

Illinois. There were no significant effects found for EASTZONE and WESTZONE (Table 7).

The coefficients for WSALER and REST, although not significant, suggest that wholesalers and restaurateurs would buy about 100 pounds per week less than retailers (Table 7).

High experience with tunas (EXPTUNA) and high ranking of albacore (RANKALB) had no significant effects on demand for low-value added products when compared to firms with moderate and no experience and with firms that ranked these products as average and below average, respectively (Table 7).

In addition, SAFETY had no significant effect on demand for low-value added albacore products (Table 7).

In the profitability equation, significant coefficients ($\alpha \leq .05$) were found for PRICE, PRICEWH, WSALER, REST, EASTZONE, WESTZONE, and OREGON.

PRICE, ceteris paribus, has a significant inverse relationship with profitability as expected. An increase in price of one dollar decreased the profitability 1.35 points. The significant coefficient for PRICEWH suggests that wholesalers are more price sensitive than retailers and restaurateurs. This may be because profit margins are lower for the large volume wholesalers handle (Table 8).

The coefficients of EASTZONE, WESTZONE, and OREGON are all significant and indicate that firms from these geographic regions have higher positive levels of profitability compared to firms located in Illinois (Table 8). The variables WSALER and REST are significant and suggest that these firm types expect greater profitability levels when compared to retail firms (Table 8). EXPTUNA, RANKALBA, and SAFETY had no significant effect on profitability (Table 8).

Overall, these results suggest that market strategies should focus on offering low prices, explore the possibilities to selling low-value added albacore products to the wholesaler sector, and targeting firms from Oregon the West and East regions rather than firms from Illinois. To increase the expectations of purchaser's profitability levels, fishermen should offer low-value added albacore products at low prices, especially to wholesalers and restaurateurs.

V.2.3. Albacore Loins.

Significant effects ($\alpha \leq .05$) on the demand for albacore loins were found for the variables PRICEWH, WSALER, REST, EXPTUNA, RANKALBA, and OREGON.

The PRICE coefficient was not significant. This might indicate that firms were not price sensitive to the range

of prices used for albacore loins, although perhaps they would be sensitive over a wider price range. The PRICEWH coefficient suggests that wholesalers would demand 1141 less pounds per week of albacore loins than restaurateurs or retailers (Table 7).

Among all three geographic location variables, only OREGON was statistically significant for demand of albacore loins. Firms from Oregon demanded 2,910 less pounds than firms from Illinois, ceteris paribus (Table 7).

The significant coefficients of WSALER and REST indicate that wholesalers and restaurateurs will purchase about 6,864 and 1796, respectively, more pounds per week of albacore loins than retailers (Table 7).

The variable EXPTUNA suggest that firms with high experience handling tunas demand 2,704 fewer pounds per week than firms with moderate and no experience with tunas. On the contrary, RANKALB indicates that firms ranking albacore above average will purchase 2493.5 more pounds per week than firms ranking albacore as average or below average when compared to other tuna species (Table 7).

SAFETY did not have significant effects on demand for albacore loins (Table 7).

Variables found to have statistically significant effects ($\alpha \leq .05$) on the profitability equation were PRICE, PRODUCT, REST, EASTZONE, and WESTZONE.

PRICE, ceteris paribus, as expected reduced profitability (2.3 points) if there is a one unit increase in this variable. The price interaction PRICEWH was not significant (Table 8).

The variable EASTZONE indicates that, among the three geographic location of firms, firms from the East region expect lower profit levels (2.88 points) than firms from Illinois when purchasing albacore loins. Firms from the West, WESTZONE, expect higher profit levels (1.86 point) than firms from Illinois (Table 8).

The Coefficient for WSALER was not significant while the coefficient for REST was highly significant when comparing profitability obtained by retailers when purchasing albacore loins. Restaurateurs profitability levels were 4.8 points higher than the profitability levels of retailers (Table 8).

The variables SAFETY, EXPALBAC, and RANKALB were not significant for profitability estimation. On the contrary, EXPTUNA, was somewhat significant ($\alpha \leq .10$) showing that the level of profitability of firms with high experience with tunas is 1.5 points higher than firms with moderate or no experience with tunas when handling albacore loins (Table 8). It was found that the variable SAFETY is not significant when estimating profitability levels obtained by firm's purchase of albacore loins (Table 8).

In order to influence buyer's behavior, fishermen might need to offer a wider price range for albacore loins, focus efforts on the seafood industry of Oregon, and target the restaurant sector. On the contrary, the wholesaler sector may not be an important market for albacore loins. Purchasers seem to prefer, based on experience, other types of tunas rather than albacore. In addition, fishermen should notice that in fact there were firms impressed by the attributes of albacore loins. Because firms from the west region, from the restaurant sector, and with high experience with tunas expect high levels of profitability, fishermen should prepare market strategies directed to businesses with these characteristics.

V.2.4. High-value Added Albacore Products.

Products included in this category were hot smoked albacore and albacore lox. These products were put in the same category because both are cooked products.

The coefficients for PRICEWH, WSALER, REST, EXPTUNA, RANKALB, EASTZONE, WESTZONE, and OREGON had statistically significant effects ($\alpha \leq .05$) on product demand.

The PRICE coefficient was not significant. This might suggest that firms were not price sensitive to the range of prices used for high-value added products. Possibly, with the use of a wider price range firms would be price

sensitive. The PRICEWH coefficient, negative as expected, indicates that wholesalers will demand about 392 pounds less per week of high-value added albacore products than restaurateurs and retailers (Table 7).

The coefficients for EASTZONE and WESTZONE suggest that firms demanding the largest amounts of high-value added albacore products are located in the west and east regions. The OREGON coefficient indicates that there are firms in Illinois demanding approximately 5,735 more pounds per week than firms located in Oregon (Table 7).

The WSALER coefficient suggests that wholesalers would buy about 2,302 more pounds per week of high-value added albacore products than retailers. On the contrary, the REST coefficient indicates that restaurateurs demanded approximately 5,649 less pounds per week of the same products than retailers, ceteris paribus (Table 7).

The EXPTUNA coefficient suggests that firms with high experience handling tunas demand 5,649.4 fewer pounds per week of high-value added albacore products than firms with moderate or no experience with tunas (Table 7).

The RANKALB coefficient reveals that firms ranking albacore above average will demand 2,474.6 less pounds per week of the same albacore products than firms ranking albacore as average or below average when compared to other tuna species (Table 7). SAFETY did not have significant

effects on demand for high-value added albacore products (Table 7).

Variables found to have statistically significant effects ($\alpha \leq .05$) on the profitability equation were PRICE, PRODUCT, SAFETY, and REST.

PRICE, ceteris paribus, as expected reduced profitability. One dollar increase in price decreased profitability by 1.87 points. PRICEWH did not have significant effects on profitability (Table 8).

PRODUCT, ceteris paribus, had a significant positive relationship with profitability as expected. The PRODUCT coefficient indicated that firms handling a high-value added product that embodies their highest rated characteristics expect a profitability level 1.39 units higher than a product with their second highest rated characteristics (Table 8).

The coefficient for REST indicates restaurateurs expect profitability levels five points higher than the profitability level for retailers when purchasing high-value added albacore products (Table 8).

The coefficient of EXPTUNA, EXPALBAC, and RANKALB were not significant. On the contrary, the SAFETY coefficient suggests that firm's profitability is going to be 1.24 points higher when the HACCP program is utilized instead of the traditional safety program (Table 8).

The former results can be taken into consideration by fishermen when marketing high-value added albacore products. Firms prefer low prices and there is a potential market in the restaurateur sector for high-value added albacore products. Because firms from the restaurant sector expect high levels of profitability, fishermen should focus their market strategies on them.

Profitability was positively influenced by the highest rated characteristics of high-value added albacore products. Therefore, fishermen could use the information generated in this research to produce hot smoked and albacore lox with the characteristics that businesses expect.

## VI. Conclusions.

In general, results of the demand and profitability models agreed with the expectations.

Seafood industry marketing strategies for albacore products should consider price ranges, the location of the firm, type of firm, firm's experience with tuna species, and firm's ranking of albacore when compared to other tuna species.

There is a potential in the seafood market for non-traditional albacore product forms. The profitable and consistent production of new albacore product forms could be feasible in the west coast non-canned tuna market. Once these products are introduced to the seafood market, it remains to be seen if there are improvements in the earnings from the marketing of non-canned albacore products.

Wholesalers, restaurateurs, and retailers stated that quality is a major concern and will influence their preferences when purchasing albacore products. To be successful the Oregon's albacore industry has to provide high quality albacore products.

If fishermen want to introduce non-traditional albacore products to the seafood market, potential buyer's belief and perceptions must be changed regarding these products.

Overall, the findings from this research might provide guidance to commercial fishermen of the Pacific Northwest to enhance the markets for albacore products.

Even though this study presents important information for fishermen to plan strategies to sell non-canned albacore products, there is a need to continue performing research on the alternative markets for these products.

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# APPENDICES

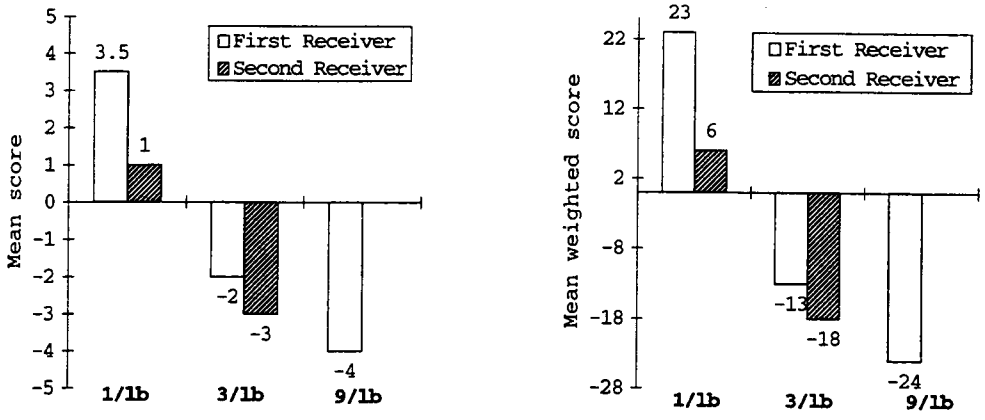



**Figure 8. Relative desirability of blood spots and bruising (instances per pound) for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

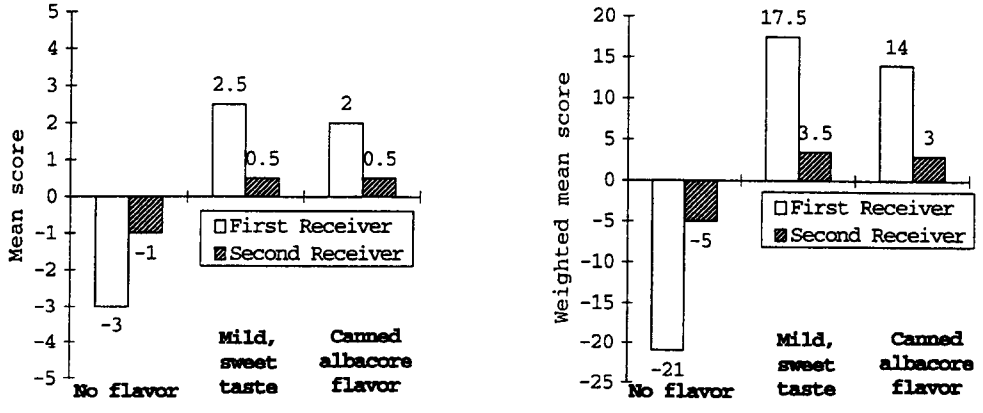



**Figure 9. Relative desirability of flavor for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

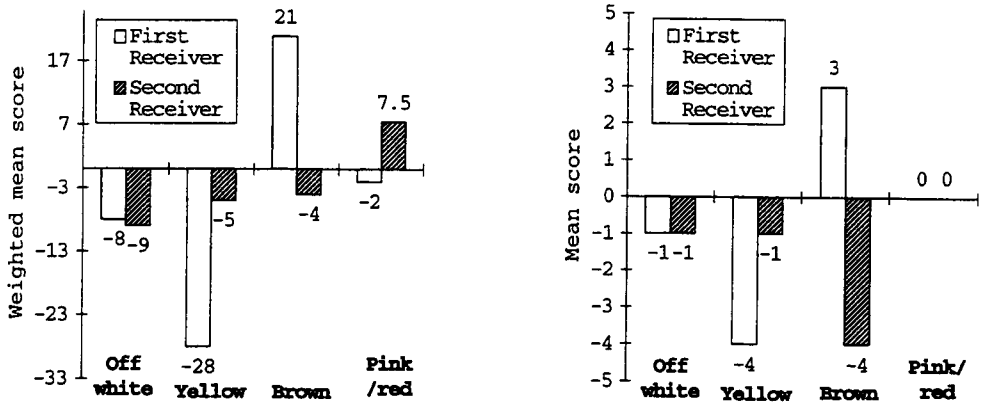



**Figure 10. Relative desirability of color for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

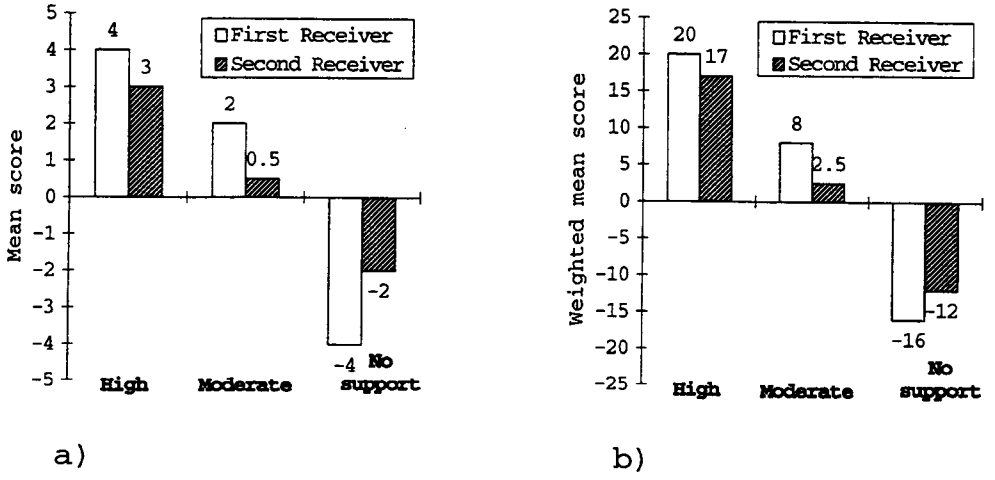
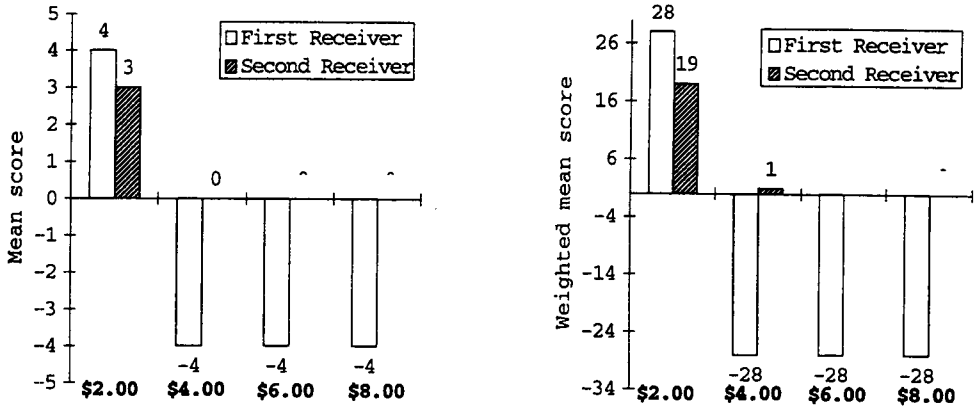
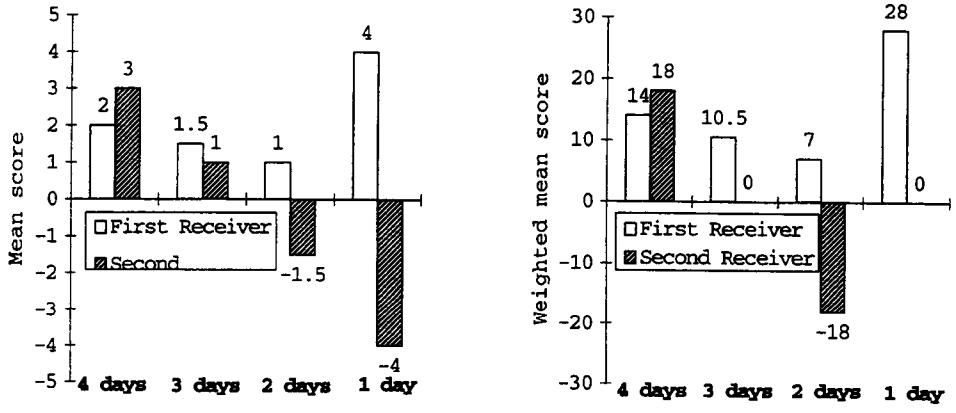



**Figure 11. Relative desirability of degree of market support for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



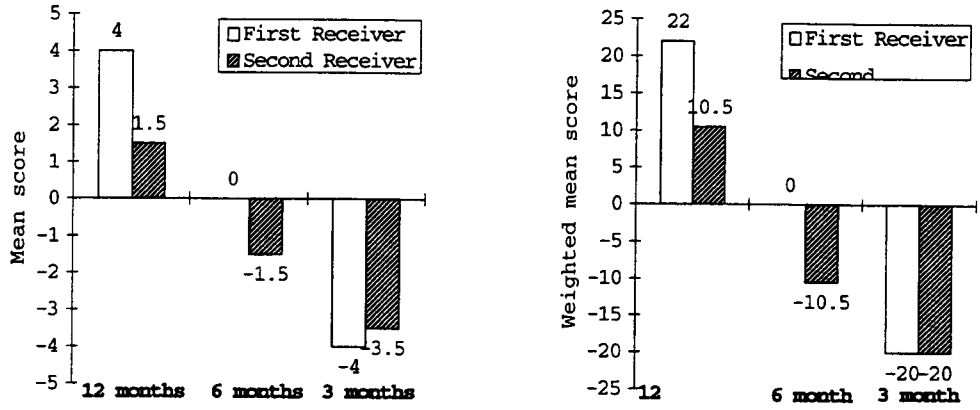

a) b)

**Figure 12. Relative desirability of price for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



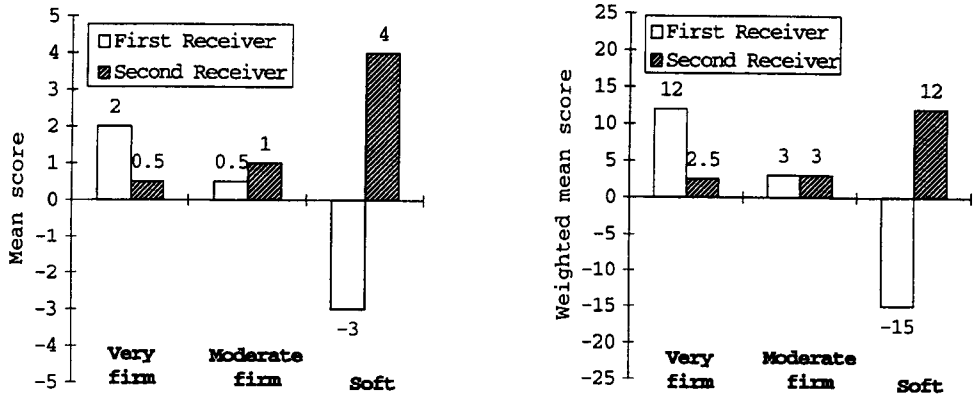

a) b)

**Figure 13. Relative desirability of shelf life chilled unpacked for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



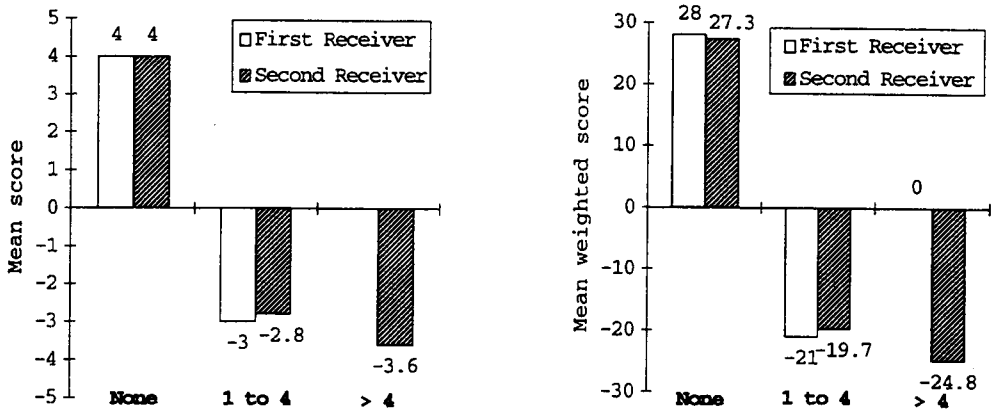

a) b)

**Figure 14. Relative desirability of supply availability for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



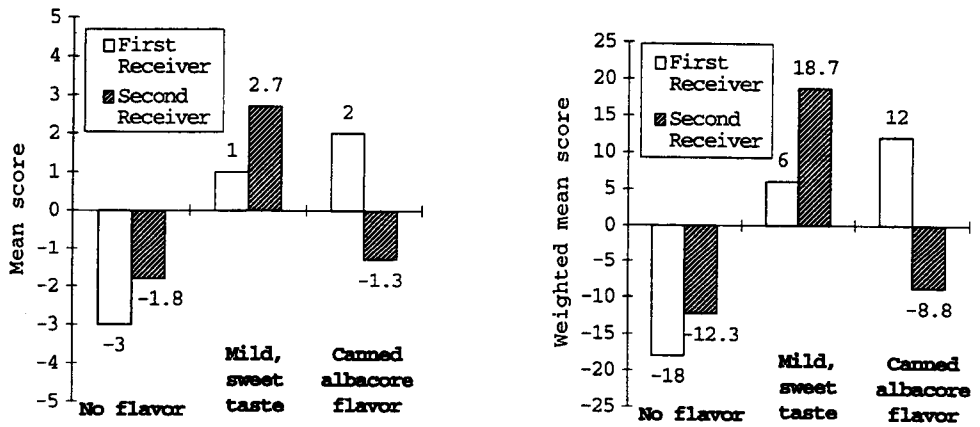

a) b)

**Figure 15. Relative desirability of texture for albacore chunks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 16. Relative desirability of instances of bruises/blood spots for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 17. Relative desirability of flavor for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

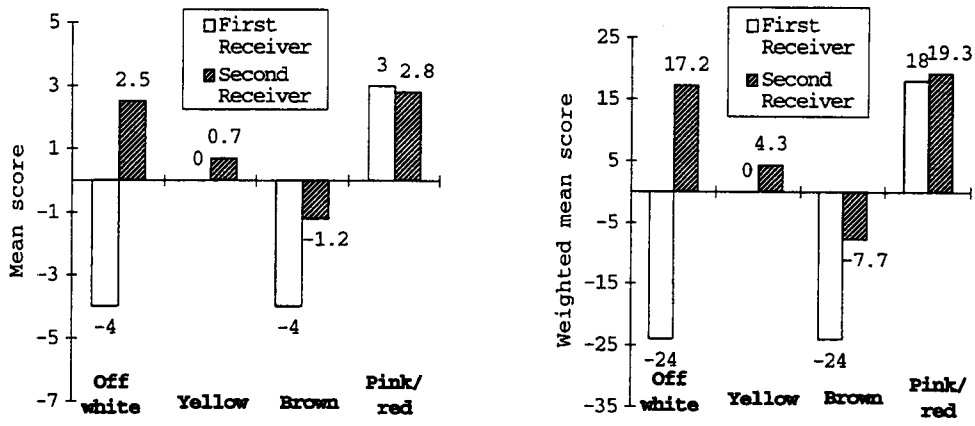



**Figure 18. Relative desirability of color for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

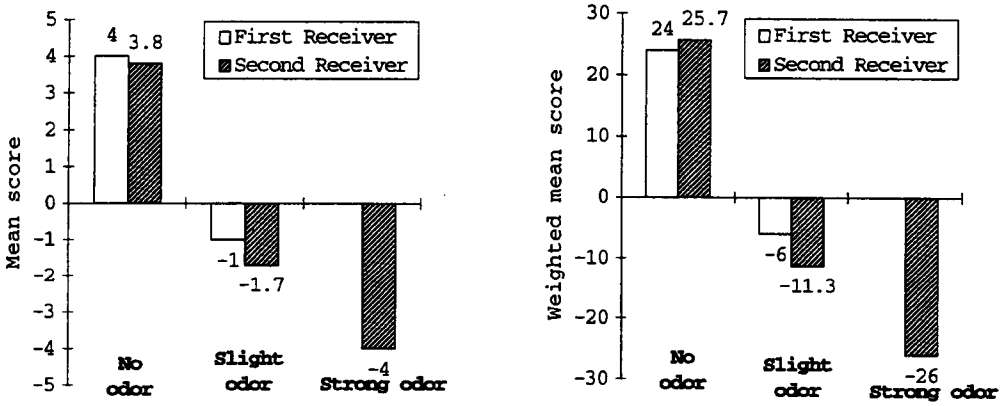
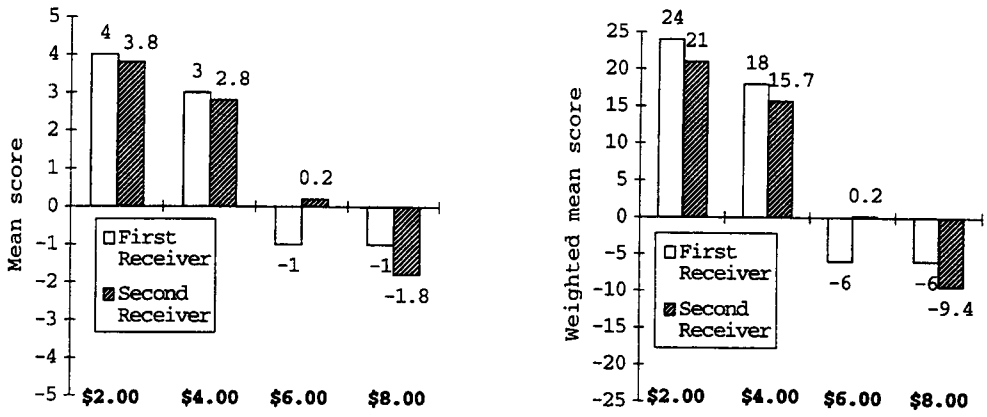
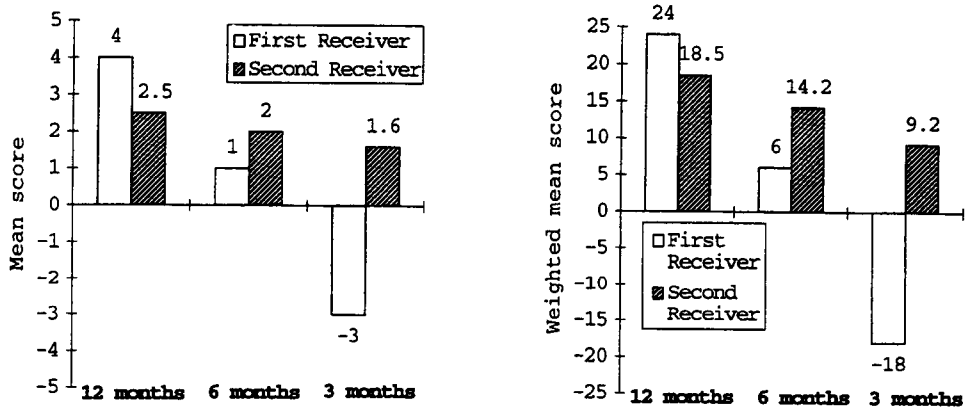



**Figure 19. Relative desirability of odor for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



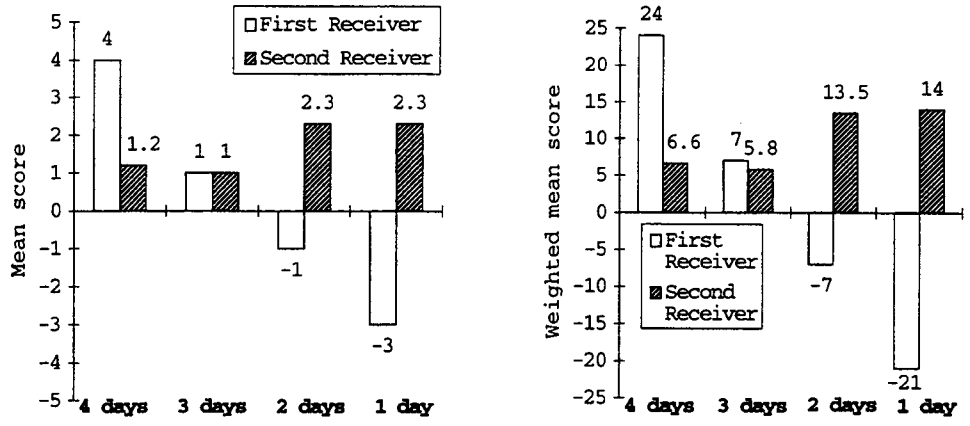

a) b)

**Figure 20. Relative desirability of price for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



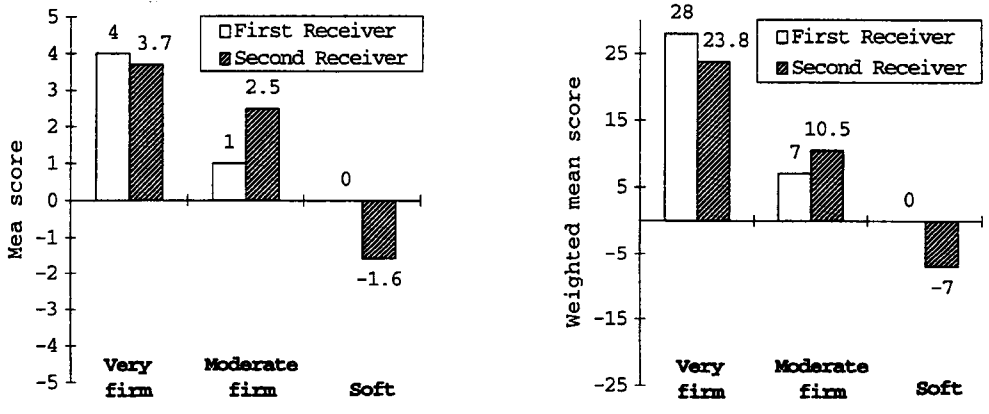

a) b)

**Figure 21. Relative desirability of shelf life frozen for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



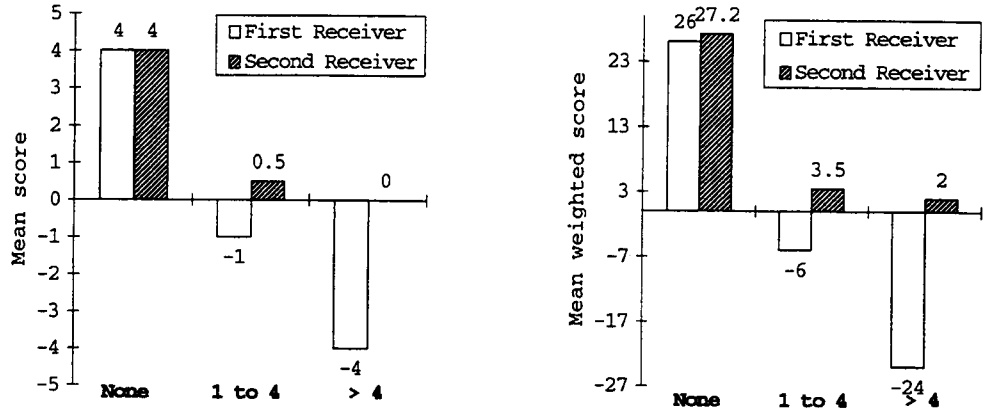

a) b)

**Figure 22. Relative desirability of shelf life thawed unpacked for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



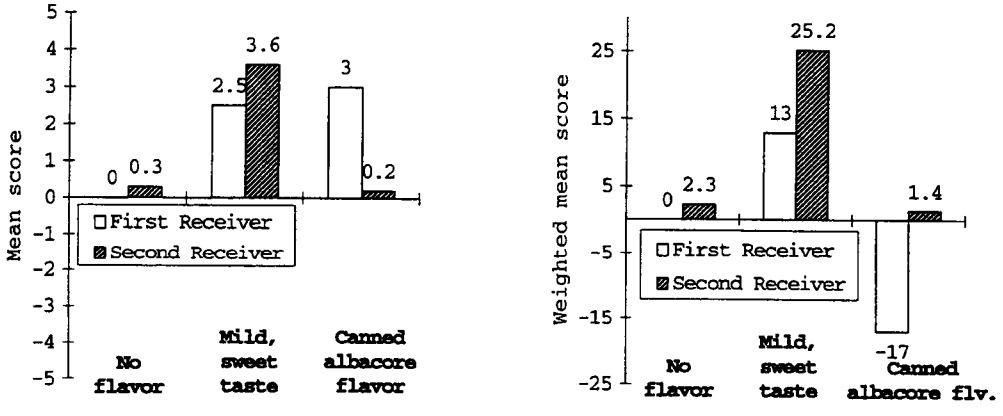

a) b)

**Figure 23. Relative desirability of texture for albacore medallions.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 24. Relative desirability of instances of bruises and blood spots for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

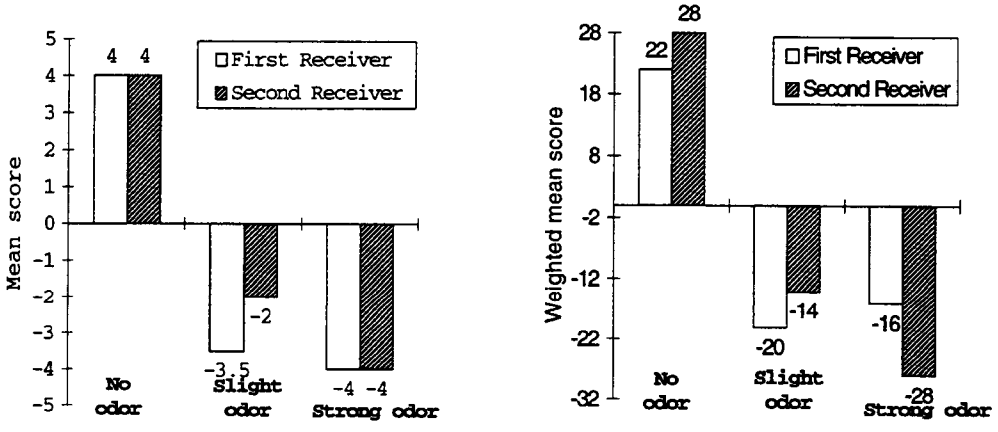



a) b)

**Figure 25. Relative desirability of flavor for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

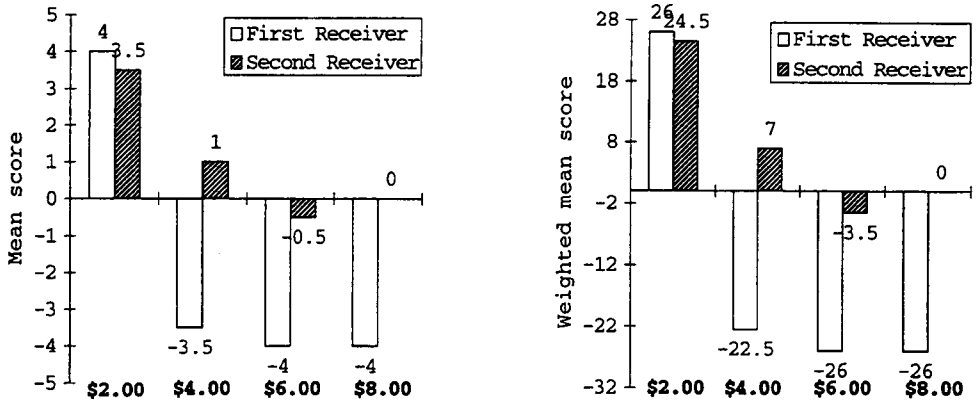

a) b)

**Figure 26. Relative desirability of flesh color for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



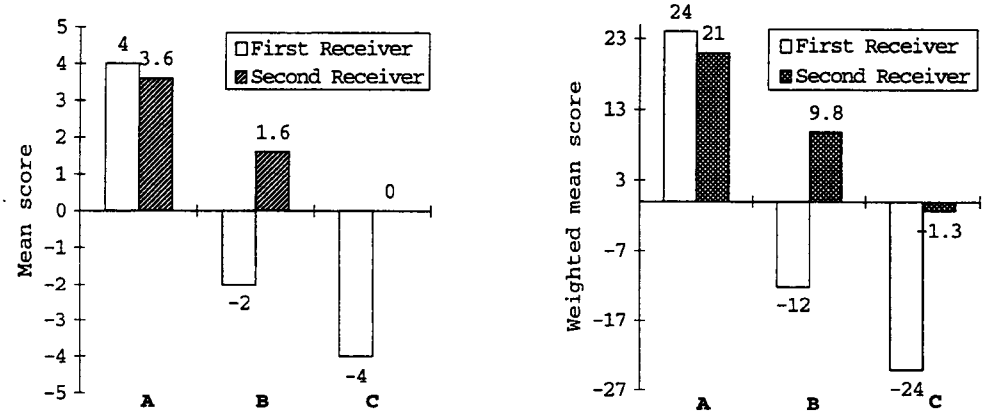

a) b)

**Figure 27. Relative desirability of odor for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



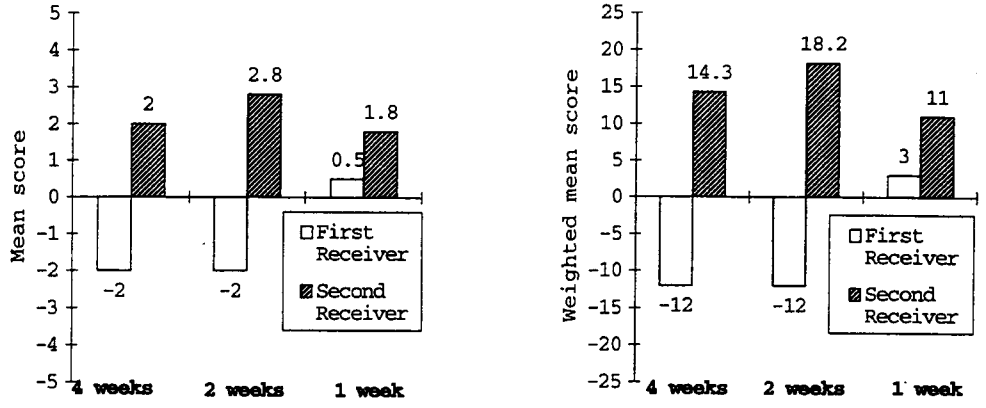

a) b)

**Figure 28. Relative desirability of price for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



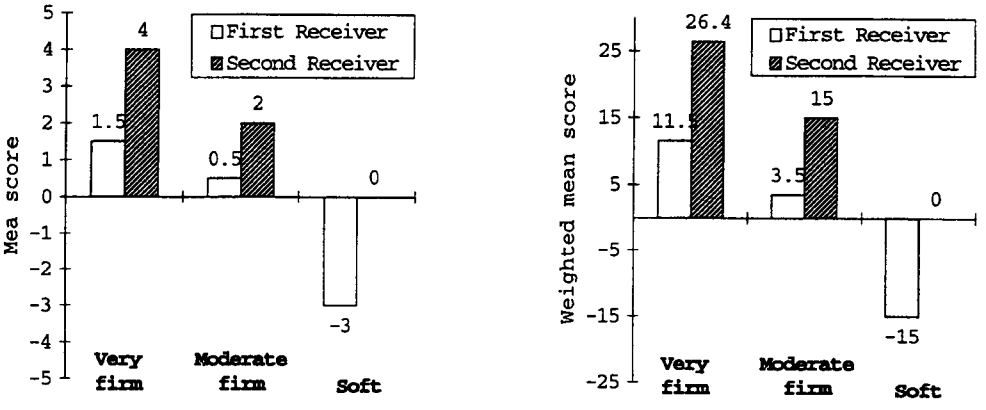

a) b)

**Figure 29. Relative desirability of product uniformity for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable. (A=As stated in label,




a) b)

**Figure 30. Relative desirability of shelf life chilled packed thawed for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 31. Relative desirability of texture for albacore steaks.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

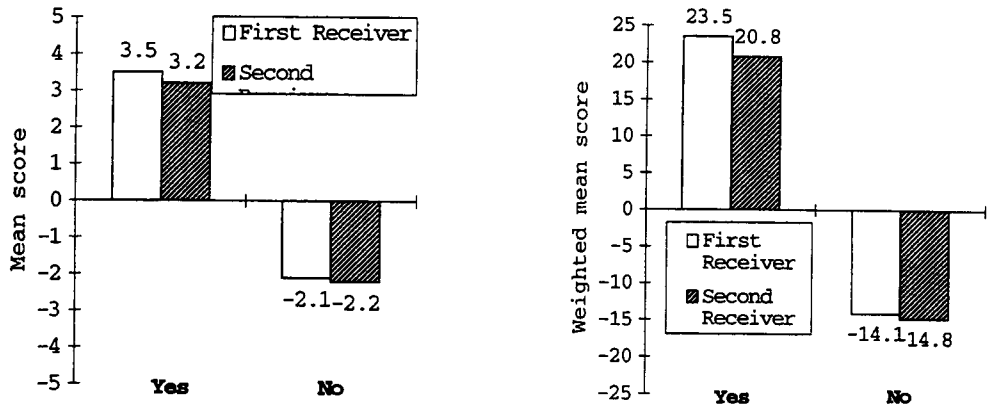



**Figure 32. Relative desirability of bled for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

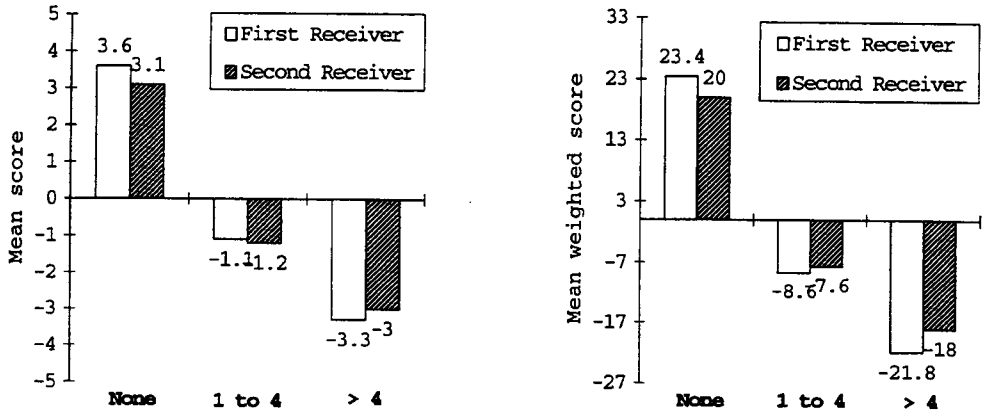
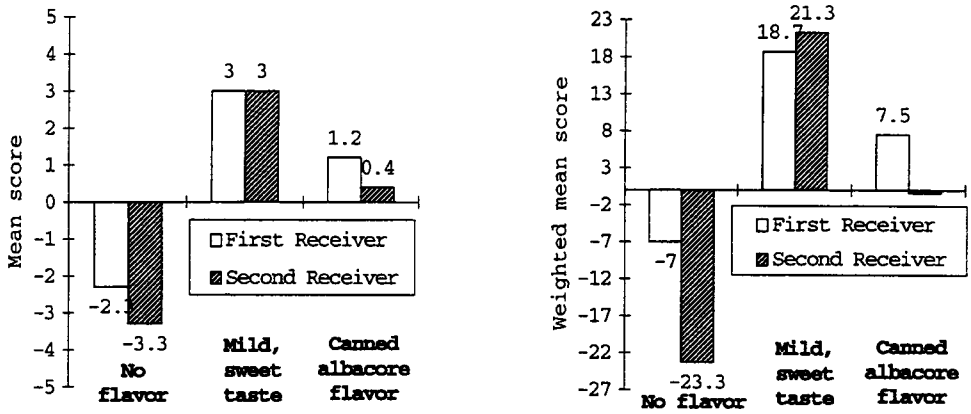
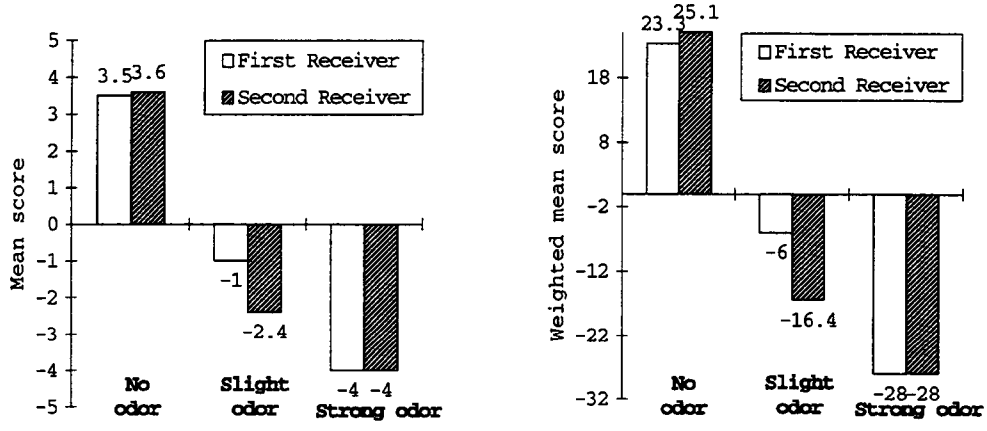



**Figure 33. Relative desirability of instances of bruises on skin for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



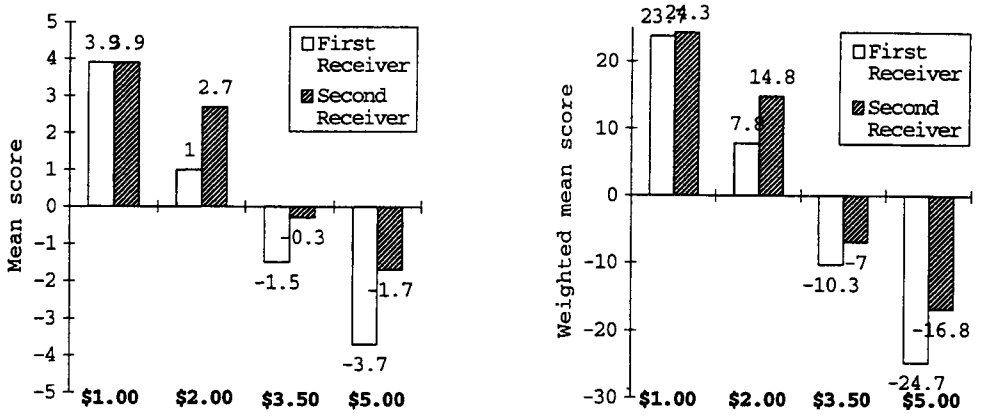

a) b)

**Figure 34. Relative desirability of flavor for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



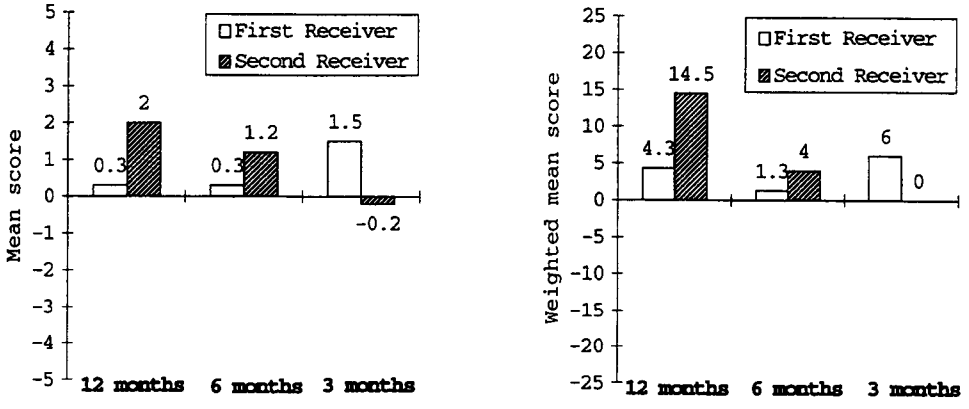

a) b)

**Figure 35. Relative desirability of odor for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



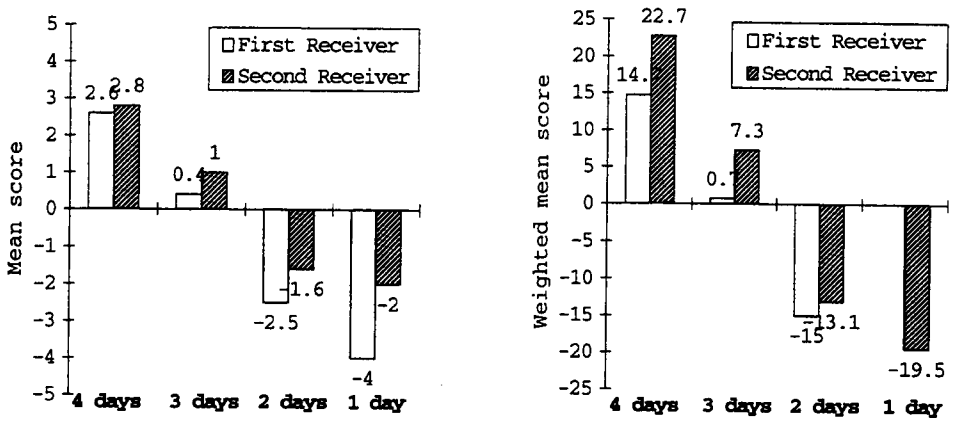

a) b)

**Figure 36. Relative desirability of price for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



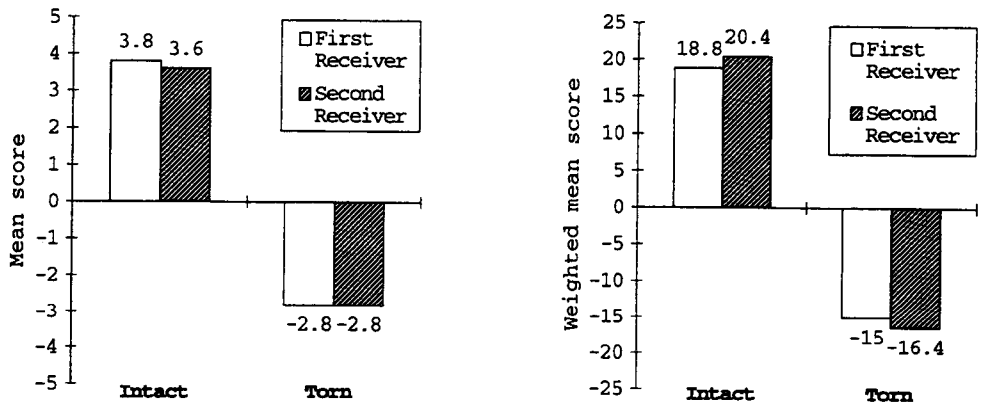

a) b)

**Figure 37. Relative desirability of shelf life frozen for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



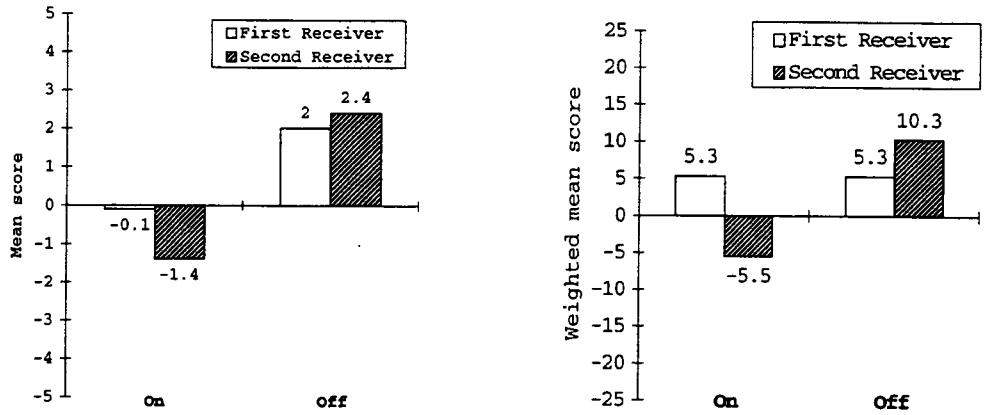

a) b)

**Figure 38. Relative desirability of shelf life chilled thawed for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



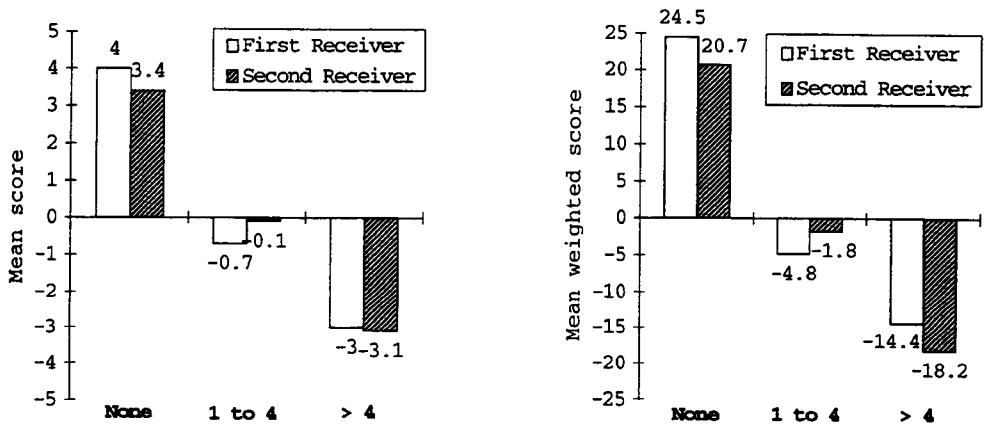

a) b)

**Figure 39. Relative desirability of skin condition for whole albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



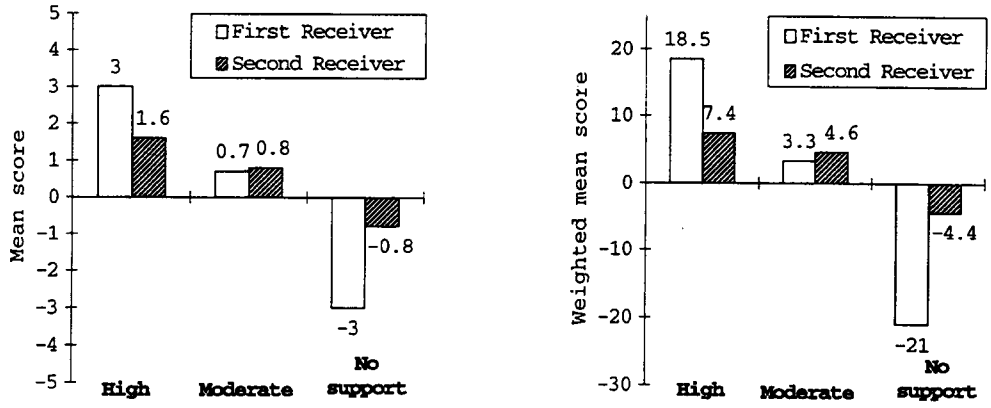

a) b)

**Figure 40. Relative desirability of belly meat for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



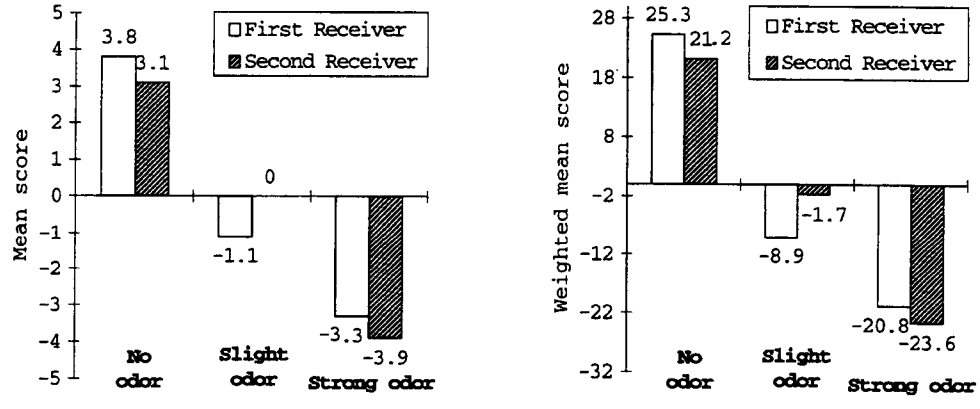

a) b)

**Figure 41. Relative desirability of bruising/blood spots for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



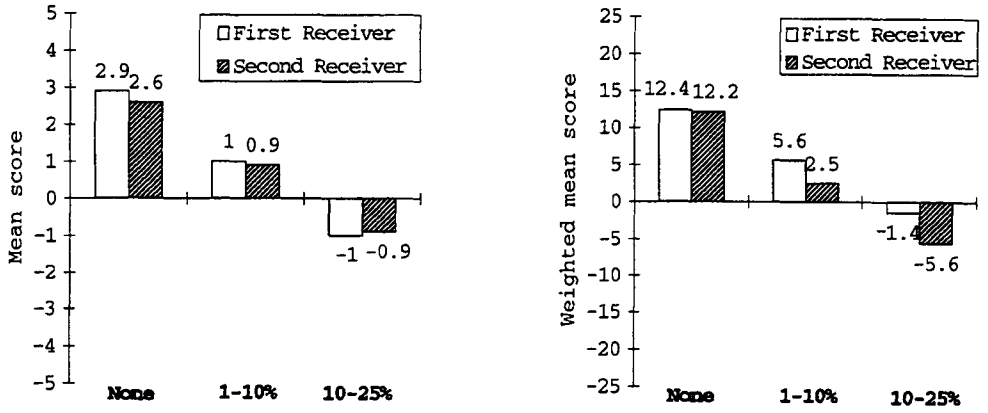

a) b)

**Figure 42. Relative desirability of market support for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



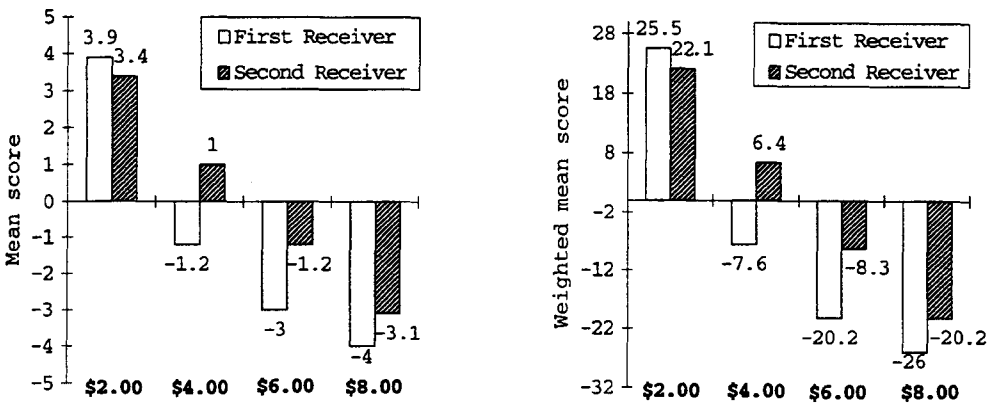

a) b)

**Figure 43. Relative desirability of odor for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



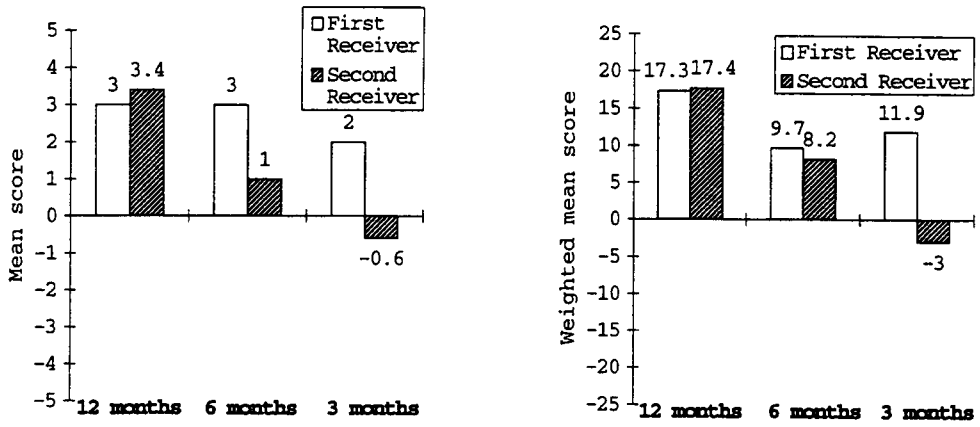

a) b)

**Figure 44. Relative desirability of presence of dark red flesh for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



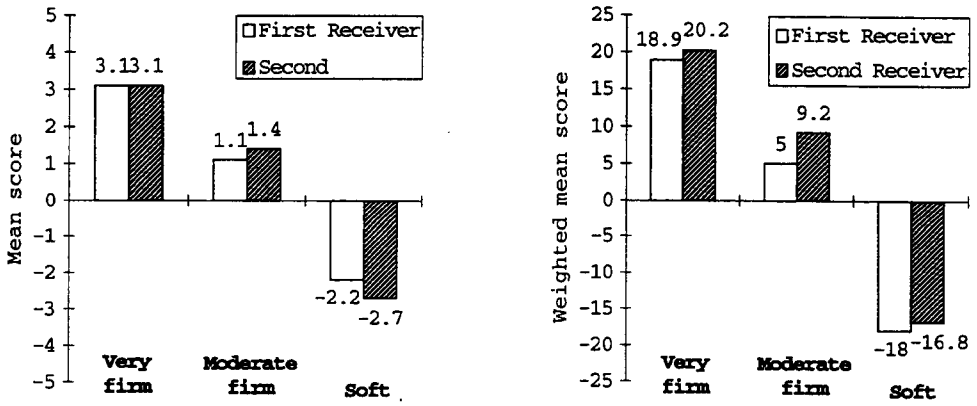

a) b)

**Figure 45. Relative desirability of price for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 46. Relative desirability of supply availability for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 47. Relative desirability of texture for albacore loins.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

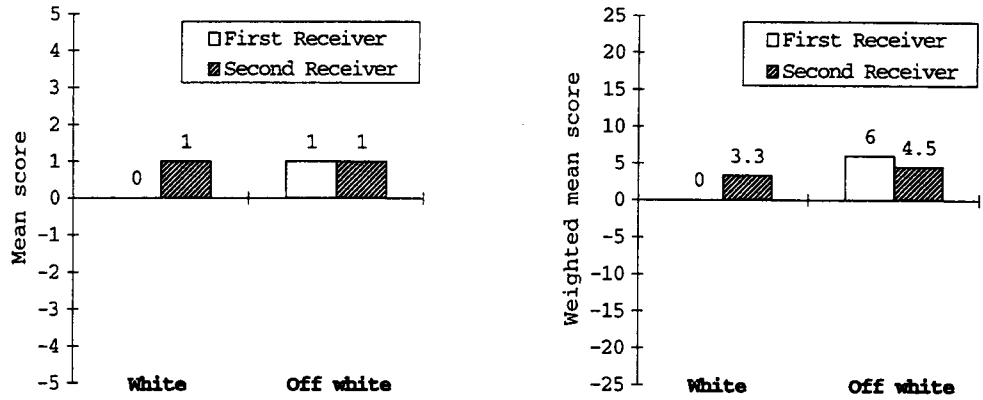



**Figure 48. Relative desirability of color for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

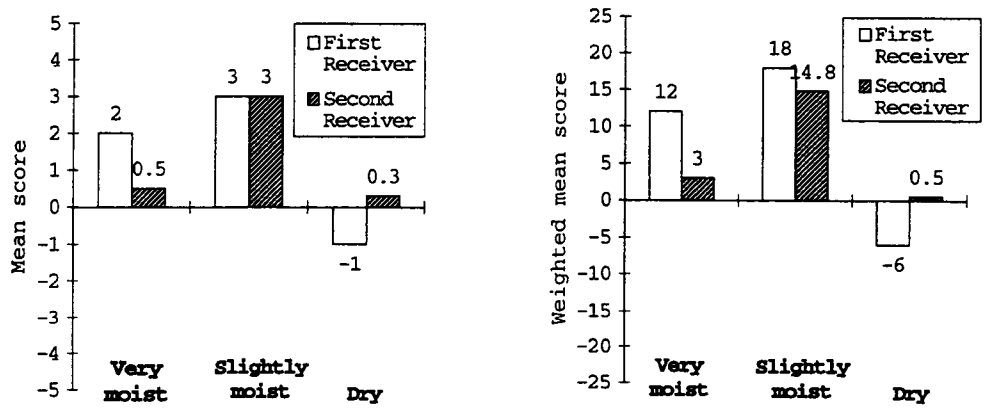



**Figure 49. Relative desirability of moistness for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

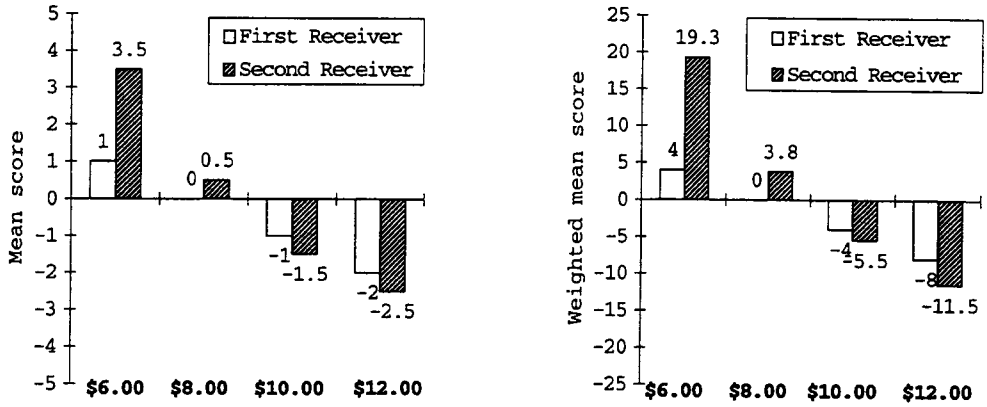



**Figure 50. Relative desirability of price for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

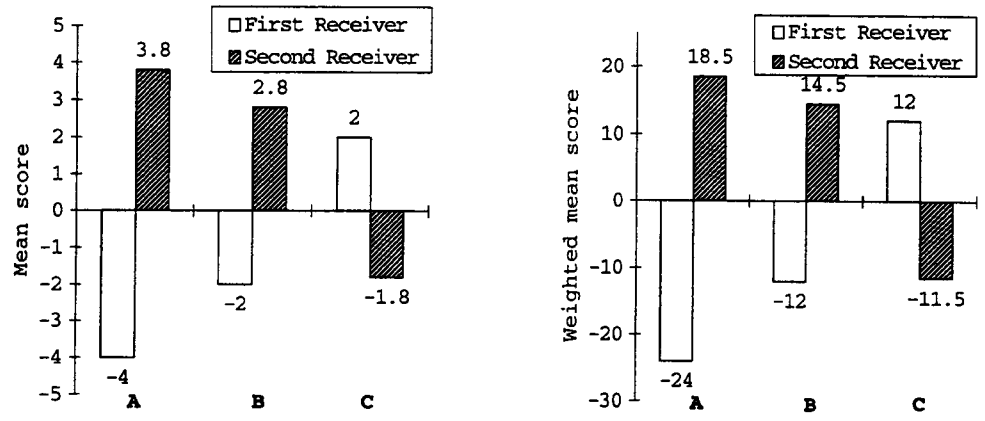
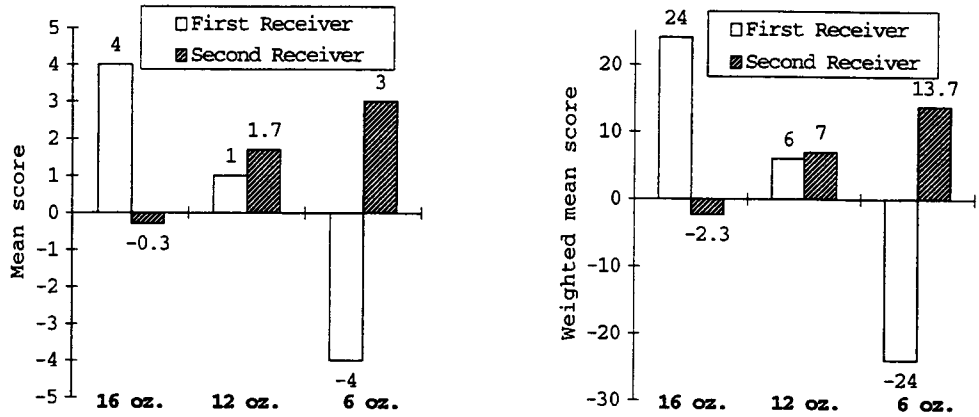
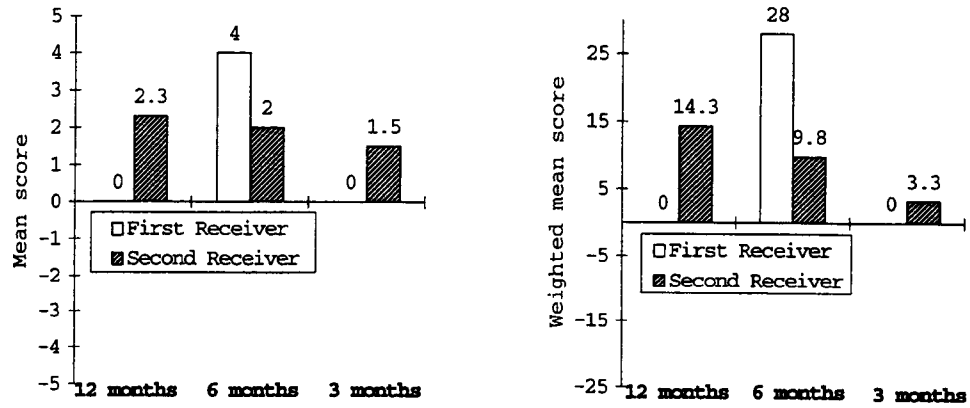



**Figure 51. Relative desirability of product uniformity for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



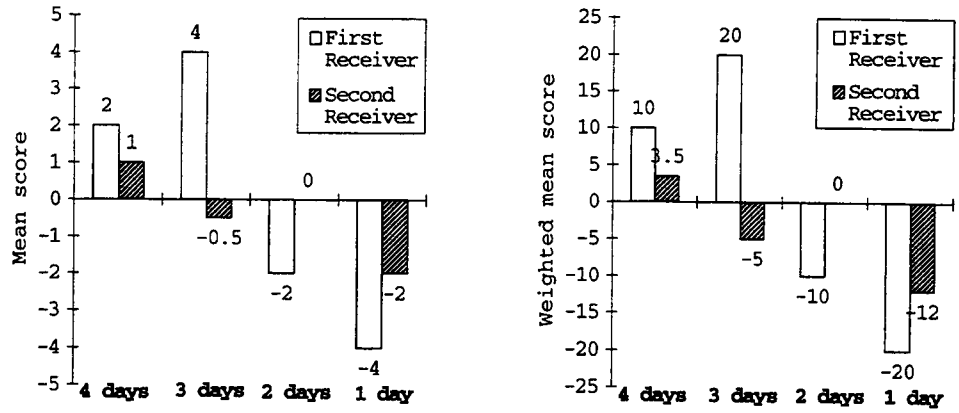

a) b)

**Figure 52. Relative desirability of product size for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



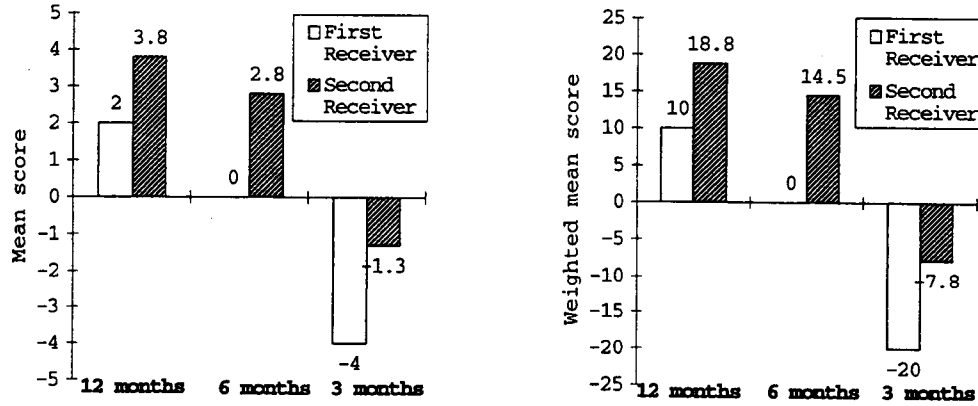

a) b)

**Figure 53. Relative desirability of shelf life frozen for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



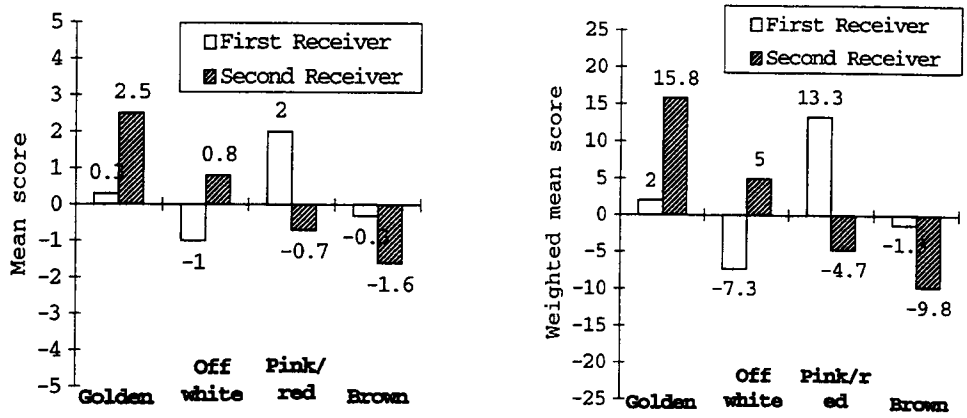

a) b)

**Figure 54. Relative desirability of shelf life thawed for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



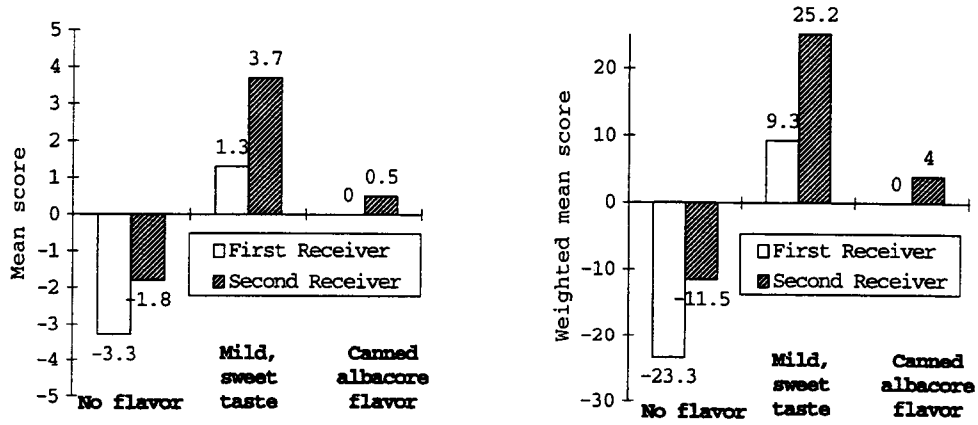

a) b)

**Figure 55. Relative desirability of supply availability for hot smoked albacore.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



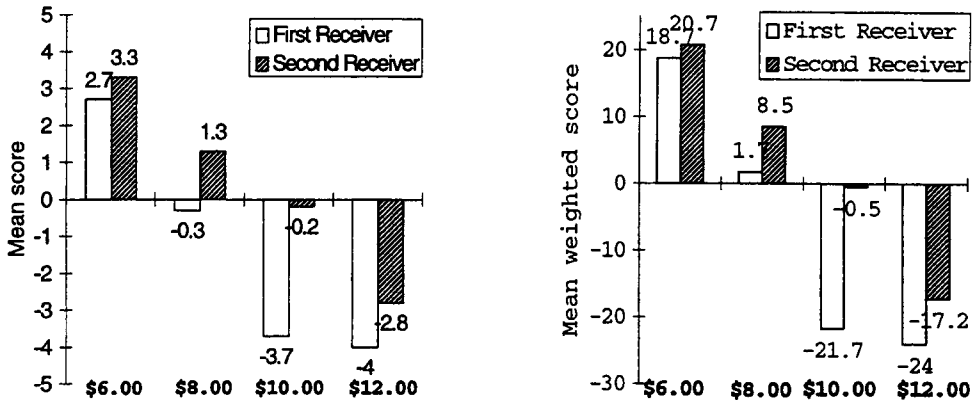

a) b)

**Figure 56. Relative desirability of color for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



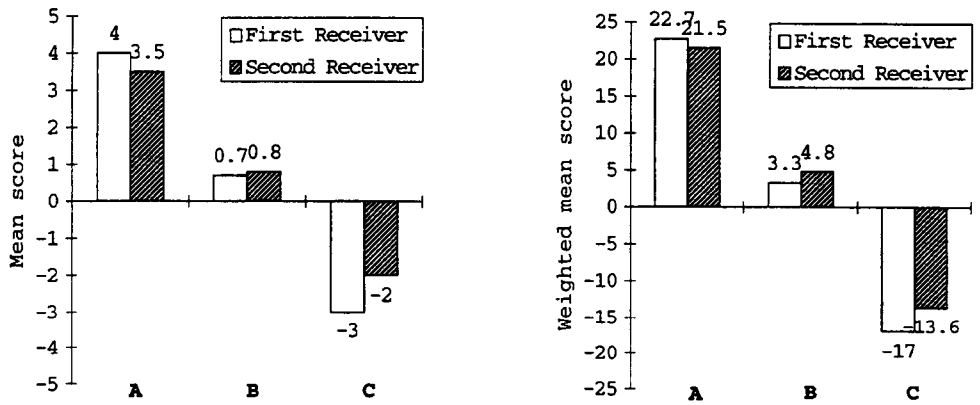

a) b)

**Figure 57. Relative desirability of flavor for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



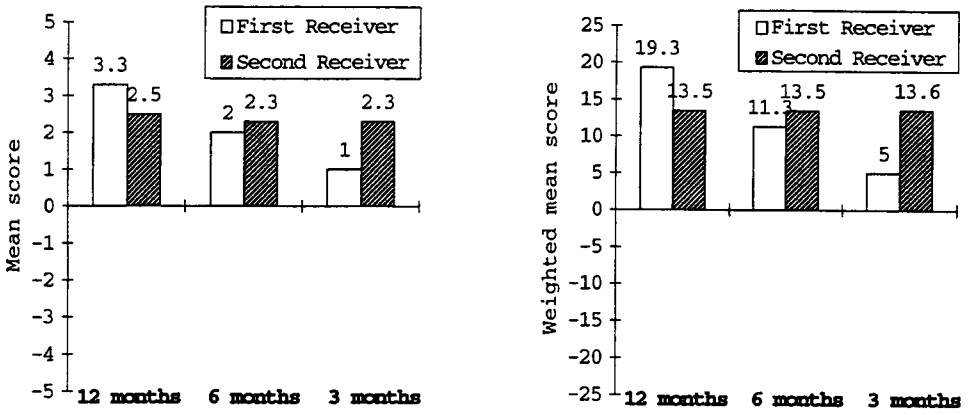

a) b)

**Figure 58. Relative desirability of price for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



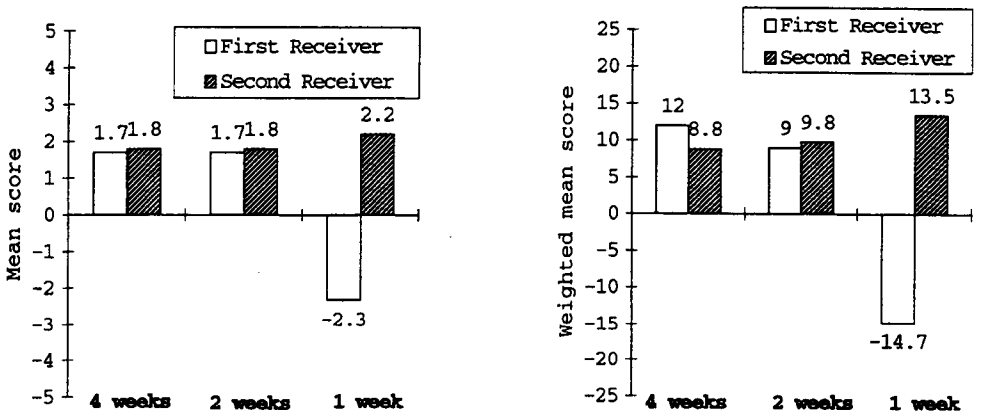

a) b)

**Figure 59. Relative desirability of product uniformity for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



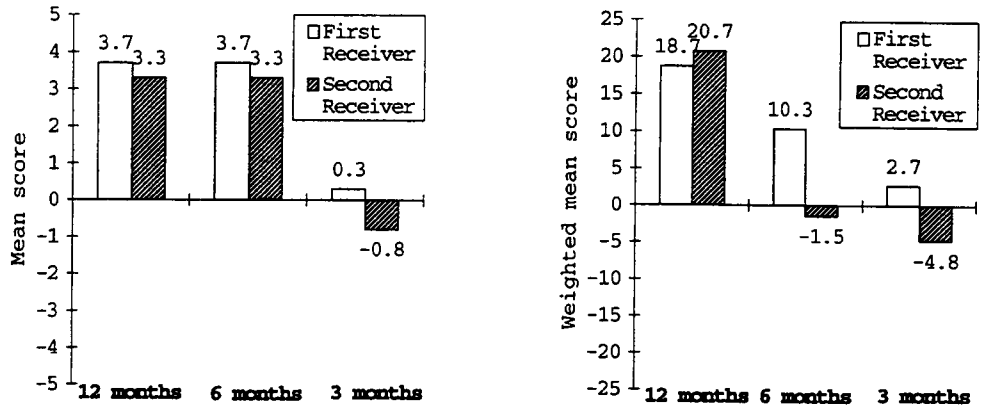

a) b)

**Figure 60. Relative desirability of shelf life frozen for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.



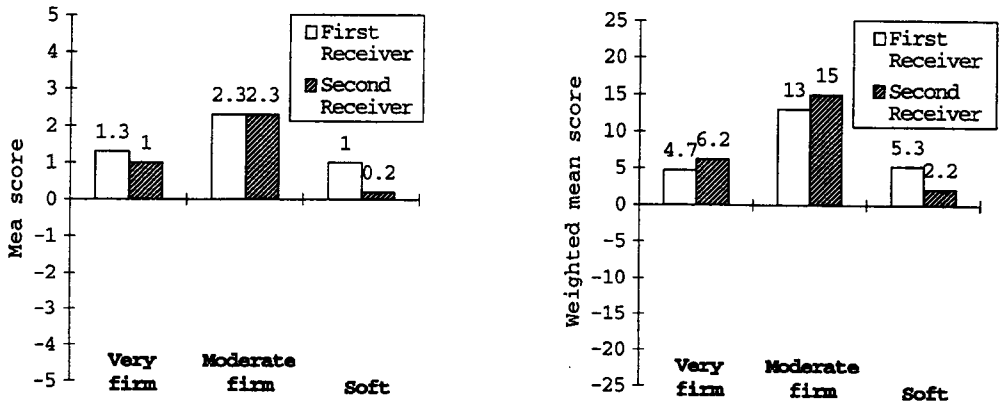

a) b)

**Figure 61. Relative desirability of shelf life thawed packed and chilled for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 62. Relative desirability of supply availability for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.




a) b)

**Figure 63. Relative desirability of texture for albacore lox.** a) Mean score, b) Weighted mean score. 4=Very desirable, 0=Neither strongly desired or undesired, and -4=Very undesirable.

# Appendix B

Table 1. Attributes and levels employed in the self explicated experiment for low value added (chunks, loins, medallions, steaks, whole) and high value added (hot smoked, loaf, lox) albacore products.

**CHUNKS**

Blood spots/ bruising
a) 1 per pound
b) 3 per pound
c) 9 per pound

Flavor
a) Bland, no flavor
b) Mild sweet taste
c) Flavor of "canned" albacore product

Flesh color
a) Off white
b) Yellow
c) Brown
d) Pink/Red

Glazing
a) Glazed
b) Unglazed

Degree of market support
a) High degree
b) Moderate degree
c) No market support

Odor
a) No odor
b) Slight odor
c) Strong odor

Origin on fish
a) Loins only
b) Loins and belly meat
c) Belly meat only

Packaging
a) Single layer vacuum
b) Vacuumed "lump" (composite)
c) Glazed loose (no vacuum)

Presence of dark red flesh
a) None
b) In 1-10% of product
c) In 10-25% of product

Price
a) $2.00/lb
b) $4.00/lb
c) $6.00/lb
d) $8.00/lb

Product uniformity
a) No more than 1% of product different that stated level of characteristics
b) No more than 5% of product different that stated level of characteristics
c) No more than 15% of product different that stated level of characteristics

Shelf life frozen
a) 12 months
b) 6 months
c) 3 months

Shelf life chilled unpacked
a) 4 days
b) 3 days
c) 2 days
d) 1 day

Size and dimensions
a) 1" x 1" x 1"
b) 2" x 2" x 2"
c) 3" x 3 " x 3"

Supply availability
a) 12 months per year
b) 6 months per year
c) 3 months per year

Texture
a) Very firm
b) Moderate firm
c) Soft

Table 1 (cont.)

**LOINS**

Belly meat
a) On
b) Off

Bones present
a) None
b) 1-4 instances
c) More than 4 instances

Blood spots/ bruising
a) No blood spots
b) 1-4 blood spots
c) More than 4 blood spots

Cuts and tears
a) None
b) 1-4 instances
c) More than 4 instances

Flavor
a) Bland, no flavor
b) Mild sweet taste
c) Flavor of "canned" albacore albacore

Flesh color
a) Off white
b) Yellow
c) Brown
d) Pink/Red

Glazing
a) Glazed
b) Unglazed

Degree of market support
a) High degree
b) Moderate degree
c) No market support

Odor (Thawed)
a) No odor
b) Slight odor
c) Strong odor

Packaging
a) Single layer vacuum
b) Vacuumed "lump" (composite)
c) Glazed loose (no vacuum)

Presence of dark red flesh
a) None
b) In 1-10% of product
c) In 10-25% of product

Price
a) $2.00/lb
b) $4.00/lb
c) $6.00/lb
d) $8.00/lb

Product uniformity
a) No more than 1% of product different that stated level of characteristics
b) No more than 5% of product different that stated level of characteristics
c) No more than 15% of product different that stated level of characteristics

Shelf life frozen
a) 12 months
b) 6 months
c) 3 months

Shelf life chilled (SLC) packed thawed
a) 4 weeks
b) 2 weeks
c) 1 week

SLC unpacked thawed
a) 4 days
b) 3 days
c) 2 days
d) 1 day

Supply availability
a) 12 months per year
b) 6 months per year
c) 3 months per year

Texture
a) Very firm
b) Moderate firm
c) Soft

Table 1 (cont.)

**MEDALLIONS**

| Belly meat | Blood spots/ bruising | Dimensions | Flavor | Flesh color |
|---|---|---|---|---|
| a) On | a) No blood spots | a) > 3" x 3" | a) Bland, no flavor | a) Off white |
| b) Off | b) 1-4 blood spot | b) 3" x 3" | b) Mild sweet taste | b) Yellow |
| | c) More than 4 blood spots | c) < 3" x 3" | c) Flavor of "canned" albacore product | c) Brown<br>d) Pink/Red |

| Glazing | Degree of market support | Odor (Thawed) | Packaging |
|---|---|---|---|
| a) Glazed | a) High degree | a) No odor | a) Vacuum packed side by side |
| b) Unglazed | b) Moderate degree | b) Slight odor | b) Vacuum packed flat |
| | c) No market support | c) Strong odor | c) Glazed loose packed |

| Presence of dark red flesh | Price | Product uniformity |
|---|---|---|
| a) None | a) $2.00/lb | a) No more than 1% of product different that stated level of characteristics |
| b) In 1-10% of product | b) $4.00/lb | b) No more than 5% of product different that stated level of characteristics |
| c) In 10-25% of product | c) $6.00/lb | c) No more than 15% of product different that stated level of characteristics |
| | d) $8.00/lb | |

| Shelf life frozen | Shelf life thawed packed | Shelf life thawed unpacked | Supply availability |
|---|---|---|---|
| a) 12 months | a) 4 weeks | a) 4 days | a) 12 months per year |
| b) 6 months | b) 2 weeks | b) 3 days | b) 6 months per year |
| c) 3 months | c) 1 week | c) 2 days | c) 3 months per year |
| | | d) 1 day | |

| Texture | Thickness |
|---|---|
| a) Very firm | a) 1" |
| b) Moderate firm | b) 1/2" |
| c) Soft | c) 3/8" |

Table 1 (cont.)

**STEAKS**

| Belly meat | Blood spots/ bruising | Dimensions | Flavor | Flesh color |
|---|---|---|---|---|
| a) On | a) No blood spots | a) Diameter 8-9" | a) Bland, no flavor | a) Off white |
| b) Off | b) 1-4 blood spot | b) Diameter 6-8" | b) Mild sweet taste | b) Yellow |
| | c) More than 4 blood spots | c) Diameter < 6" | c) Flavor of "canned" albacore product | c) Brown<br>d) Pink/Red |

| Glazing | Degree of market support | Odor (Thawed) | Packaging |
|---|---|---|---|
| a) Glazed | a) High degree | a) No odor | a) Vacuum packed side by side |
| b) Unglazed | b) Moderate degree | b) Slight odor | b) Vacuum individual |
| | c) No market support | c) Strong odor | c) Glazed loose pack |

| Price | Product uniformity | Shelf life frozen |
|---|---|---|
| a) $2.00/lb | a) No more than 1% of product different that stated level of characteristics | a) 12 months |
| b) $4.00/lb | b) No more than 5% of product different that stated level of characteristics | b) 6 months |
| c) $6.00/lb | c) No more than 15% of product different that stated level of characteristics | c) 3 months |
| d) $8.00/lb | | |

| Shelf life chilled packed thawed | Shelf life chilled unpacked thawed | Skin | Supply availability |
|---|---|---|---|
| a) 4 weeks | a) 4 days | a) On | a) 12 months per year |
| b) 2 weeks | b) 3 days | b) Off | b) 6 months per year |
| c) 1 week | c) 2 days | | c) 3 months per year |
| | d) 1 day | | |

| Texture | Thickness |
|---|---|
| a) Very firm | a) 1" |
| b) Moderate firm | b) 1/2" |
| c) Soft | c) 5/8" |

Table 1 (cont.)

**WHOLE**

| Bleed | Bruises on skin | Fins and tail | Flavor | Glazing | Head |
|---|---|---|---|---|---|
| a) Yes | a) None | a) Present | a) Bland, no flavor | a) Glazed | a) On |
| b) No | b) 1-4 instances | b) Not present | b) Mild sweet taste | b) Unglazed | b) Off |
| | c) > 4 instances | | c) Flavor of "canned" albacore product | | |

| Degree of market support | Odor (Thawed) | Price | Product uniformity |
|---|---|---|---|
| a) High degree | a) No odor | a) $1.00/lb | a) No more than 1% of product different that stated level of characteristics |
| b) Moderate degree | b) Slight odor | b) $2.00/lb | b) No more than 5% of product different that stated level of characteristics |
| c) No market support | c) Strong odor | c) $3.50/lb | c) No more than 15% of product different that stated level of characteristics |
| | | d) $5.00/lb | |

| Shelf life frozen | Shelf life thawed chilled | Skin condition | Skin color thawed (dorsal) |
|---|---|---|---|
| a) 12 months | a) 4 days | a) On | a) Blue black shiny |
| b) 6 months | b) 3 days | b) Off | b) Black shiny |
| c) 3 months | c) 2 days | | c) Black dull |
| | d) 1 day | | d) Gray |

| Supply availability | Viscera present |
|---|---|
| a) 12 months per year | a) Ungutted |
| b) 6 months per year | b) Gutted |
| c) 3 months per year | |

Table 1 (cont.)

**HOT SMOKED**

| Color | Marinade intensity | Degree of market support | Moistness |
|---|---|---|---|
| a) White | a) Strong marinated flavored | a) High degree | a) Very moist |
| b) Off white | b) Slightly marinated flavored | b) Moderate degree | b) Slightly moist |
| | c) No marinated flavor | c) No market support | c) Dry |

| Packaging | Price | Product uniformity |
|---|---|---|
| a) Colored vacuumed | a) $6.00/lb | a) No more than 1% of product different that stated level of characteristics |
| b) Clear vacuum | b) $8.00/lb | b) No more than 5% of product different that stated level of characteristics |
| c) Shrink wrapped | c) $10.00/lb | c) No more than 15% of product different that stated level of characteristics |
| d) Loose in plastic bag | d) $12.00/lb | |

| Product size | Shelf life frozen | Shelf life thawed unpacked | Shelf life thawed vacuumed | Supply availability |
|---|---|---|---|---|
| a) 16 oz. | a) 12 months | a) 4 days | a) 6 weeks | a) 12 months per year |
| b) 12 oz. | b) 6 months | b) 3 days | b) 4 weeks | b) 6 months per year |
| c) 6 oz. | c) 3 months | c) 2 days | c) 2 weeks | c) 3 months per year |
| | | d) 1 day | | |

| Texture | Type of smoke |
|---|---|
| a) Very firm | a) Oak |
| b) Moderate firm | b) Alder |
| c) Soft | c) Beech |
| | d) Hickory |

Table 1 (cont.)

**LOAF**

Color

a) White
b) Off white

Contents

a) White meat only
b) White meat and belly meat
c) White and red meat
d) White, red, and belly meat

Flavor

a) Bland, no flavor
b) Mild sweet taste
c) Flavor of "canned" albacore product

Form

a) Whole glazed
b) Whole vacuumed
c) Sliced vacuumed side by side
d) Sliced vacuumed flat

Degree of market support

a) High degree
b) Moderate degree
c) No market support

Odor (Thawed)

a) No odor
b) Slight odor
c) Strong odor

Packaging

a) Vacuumed
b) Glazed loose in a bag

Price

a) $4.00/lb
b) $6.00/lb
c) $8.00/lb
d) $10.00/lb

Product uniformity

a) No more than 1% of product different that stated level of characteristics
b) No more than 5% of product different that stated level of characteristics
c) No more than 15% of product different that stated level of characteristics

Shelf life frozen

a) 12 months
b) 6 months
c) 3 months

Shelf life packed (chilled)

a) 4 weeks
b) 2 weeks
c) 1 week

Shelf life unpacked (chilled)

a) 4 days
b) 3 days
c) 2 days
d) 1 day

Supply availability

a) 12 months per year
b) 6 months per year
c) 3 months per year

Texture

a) Very firm
b) Moderate firm
c) Soft

Table 1 (cont.)

**LOX**

Color
a) Golden
b) Off white
c) Pink
d) Brown

Coloring (dye)
a) Used - natural only
b) Used - Artificial only
c) Not used

Flavor
a) Bland, no flavor
b) Mild sweet taste
c) Flavor of "canned" albacore product

Degree of market support
a) High degree
b) Moderate degree
c) No market support

Oil content
a) Very oily
b) Somewhat oily
c) No oil and dry

Package
a) Vacuum backing board
b) Vacuum colored back.
c) Vacuum clear plastic
d) Shrink wrap

Packaging
a) Vacuum in layers on top of each other
b) Vacuum layers interlaced spread diagonally
c) Vacuum layers diagonal no interlace
d) Vacuum layers on top of each other interlaced

Price
a) $6.00/lb
b) $8.00/lb
c) $10.00/lb
d) $12.00/lb

Product uniformity
a) < 1% of product different than stated in label
b) < 5% of product different ..
c) < 15% of product different ..

Salt content
a) Very salty
b) Somewhat salty
c) Low salt content

Shelf life frozen
a) 12 months
b) 6 months
c) 3 months

Shelf life thawed (SLT) packed and chilled
a) 4 weeks
b) 2 weeks
c) 1 week

SLT unpacked and chilled
a) 4 days
b) 3 days
c) 2 days
d) 1 day

Slice dimensions
a) 6" x 3 "
b) 6" x 2 "
c) 5" x 3 "

Slices/package
a) 15
b) 10
c) 5

Supply availability
a) 12 months per year
b) 6 months per year
c) 3 months per year

Texture
a) Very firm
b) Moderate firm
c) Soft

Table 2. Attributes and levels for hypothetical albacore products employed in the conjoint experiment.

| | Attribute levels | | | | |
|---|---|---|---|---|---|
| | Low-value added | | | | |
| Attribute | Chunks | Loins | Medallions | Steaks | Whole |
| Product Characteristics | Your Highest Rated Characteristics<br>Your Second Highest Rated Characteristics | | | | |
| Price per Pound | $2.00<br>$3.50<br>$5.00 | $2.00<br>$3.50<br>$5.00 | $2.00<br>$3.50<br>$5.00 | $2.00<br>$3.50<br>$5.00 | $2.00<br>$3.50<br>$5.00 |
| Quality Program | Oregon's Quality Program<br>Your Seafood Supplier's Quality Program | | | | |
| Safety Program | Proposed FDA Mandated Safety Program (HACCP)<br>Traditional Safety Program | | | | |

Table 2 (Cont.)

| | Attribute levels | | |
|---|---|---|---|
| | High-value added | | |
| Attribute | Hot Smoked | Loaf | Lox |
| Product Characteristics | Your Highest Rated Characteristics<br>Your Second Highest Rated Characteristics | | |
| Price per Pound | $4.00<br>$6.50<br>$9.00 | $4.00<br>$6.50<br>$9.00 | $4.00<br>$6.50<br>$9.00 |
| Quality Program | Oregon's Quality Program<br>Your Seafood Supplier's Quality Program | | |
| Safety Program | Proposed FDA Mandated Safety Program (HACCP)<br>Traditional Safety Program | | |

Note: Price levels for whole albacore were changed by interviewers to $1.00, $3.00, and $5.00 in some surveys due to a request from the interviewees.

Table 3. Definition of Attributes, Variables, and attribute levels employed in the conjoint analysis experiment.

| | | | Attribute levels | |
|---|---|---|---|---|
| Attribute | Variable | Whole | Low-value added | High-value added |
| Price FOB Seattle (dollar/lb) | PRICE | 1, 2, 3.50 | 2, 4, 6, 8 | 6, 8, 10, 12 |
| Product characteristics (1 if Highest Rated Characteristic; 0 otherwise) | PRODUCT | Your Highest Rated Characteristics<br>Your Second Highest Rated Characteristics | | |
| Quality program (1 if Oregon's Quality Program; 0 otherwise) | QUALITY | Oregon's Quality Program<br>Your Seafood Supplier's Quality Program | | |
| Safety program (1 if Proposed FDA Mandated HACCP; 0 otherwise) | SAFETY | Proposed FDA Mandated Safety Program (HACCP)<br>Traditional Safety Program | | |
| Wholesaler (1 if wholesaler; 0 otherwise) | WSALER | N/A | | |
| Restaurant (1 if wholesaler; 0 otherwise) | REST | N/A | | |

Table 3 (Cont.)

| Attribute | Variable | Attribute levels | | |
|---|---|---|---|---|
| | | Whole | Low-value added | High-value added |
| Experience with tunas (1 if high experience with tunas; 0 otherwise) | EXPTUNA | N/A | | |
| Experience with albacore (1 if high experience with albacore; 0 otherwise) | EXPALBAC | N/A | | |
| Ranking of albacore compared with other tuna species (1 if above average; 0 otherwise) | RANKALB | N/A | | |
| Firms from the East of US (1 if firm is located in ILL, NY, NJ; 0 otherwise) | EASTZONE | N/A | | |
| Firms from the West of US (1 if firm is located in CA, OR, WA; 0 otherwise) | WESTZONE | N/A | | |

Table 3 (Cont.)

| Attribute | Variable | Attribute levels | | |
|---|---|---|---|---|
| | | Whole | Low-value added | High-value added |
| Firms from Oregon (1 if firm is located in Oregon; 0 otherwise) | OREGON | N/A | | |
| Interaction price with wholesaler sector | PRICEWH | N/A | | |

**Table 4. States and cities where the albacore survey was conducted.**

| *State* | *City* | *Quantity* | |
|---|---|---|---|
| California | Long Beach | 1 | |
| | Los Angeles | 14 | |
| | Montebello | 1 | |
| | N. Hollywood | 1 | Subtotal: 17 |
| Illinois | Chicago | 19 | |
| | Franklin Park | 1 | |
| | Glenview | 1 | |
| | Niles | 1 | Subtotal: 22 |
| New Jersey | Elizabeth | 1 | Subtotal: 1 |
| New York | Bohemia | 1 | |
| | Brooklin | 1 | |
| | Manhatan | 2 | |
| | New York | 15 | Subtotal: 19 |
| Oregon | Beaverton | 1 | |
| | Clackamas | 1 | |
| | Lake Oswego | 1 | |
| | Oregon City | 1 | |
| | Portland | 5 | Subtotal: 9 |
| Washington | Belleuve | 1 | |
| | Bothell | 2 | |
| | Kirkland | 3 | |
| | Seattle | 10 | |
| | Woodinville | 1 | Subtotal: 17 |
| No locality | | 2 | Subtotal: 2 |

**TOTAL: 87**

**Table 5. Types of firms interviewed during the survey.**

| *Type of Firm* | *Number* | *Percentage* |
|---|---|---|
| *Restaurants* | *36* | *41.40%* |
| *Wholesalers* | *28* | *32.20%* |
| *Retailers* | *16* | *18.40%* |
| *Other (a)* | *7* | *8.00%* |

**(a) Includes one purchaser for hospitals, one retirement home, one store chain, one supermarket chain, one smokehouse, one trader, and one missing value.**

Table 6. Mean score, highest mean weighted score, and second highest mean weighted score for attributes of low and high value added albacore products given by first receivers (wholesalers) and second receivers (retailers and restaurateurs).

| | | Whole Albacore | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| Attribute | Mean score | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Bled | 6.6 | 23.5 | -14.1 | 20.8 | -14.8 |
| Bruises on skin | 6.2 | 23.4 | -8.6 | 20 | -7.6 |
| Fins and tail | 3.3 | 1.3 | -2.3 | 5.8 | -5.5 |
| Flavor | 6.7 | 18.7 | 7.5 | 21.3 | -0.4 |
| Glazing | 5.9 | 24 | -24 | 15.3 | -9.5 |
| Head | 3.3 | 6.1 | 2.7 | 6 | -0.6 |
| Market support | 4.1 | 5.7 | 3.9 | 15.5 | 6.8 |
| Odor | 6.9 | 23.3 | -6 | 25.1 | -16.4 |
| Price | 6.4 | 23.7 | 7.8 | 24.3 | 14.8 |
| Product uniformity | 5.7 | 12.9 | -0.4 | 18.8 | 5.6 |
| Shelf life frozen | 5.8 | 4.3 | 1.3 | 14.5 | 4 |
| Shelf life thawed ch. | 6.3 | 14.7 | 0.7 | 22.7 | 7.3 |
| Skin condition | 5.6 | 18.8 | -15 | 20.4 | -16.4 |
| Skin color thawed | 5 | 17.2 | 6.6 | 20.4 | 12.2 |
| Supply availability | 5.5 | 20.1 | 4.1 | 20.2 | 15.9 |
| Viscera present | 5.4 | 12.6 | -2.3 | 15.2 | -12.5 |
| TOTAL | 88.7 | 250.3 | -38.1 | 286.3 | -17.1 |

Note: "ch." indicates chilled.

(Cont. Table 6)

| Attribute | Mean score | Albacore Chunks | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| | | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Blood spots/bruising | 6.3 | 23 | -13 | 6 | -18 |
| Flavor | 6.8 | 17.5 | 14 | 3.5 | 3 |
| Flesh color | 6.3 | 21 | -2 | 7.5 | -4 |
| Glazing | 5.3 | 28 | -4 | 4 | -12 |
| Market support | 5.3 | 20 | 8 | 17 | 2.5 |
| Odor | 5.5 | 26 | 0 | 11.5 | -13 |
| Origin on fish | 5 | 18 | 2 | 24 | 0 |
| Packaging | 4.3 | 15.5 | 7.5 | 3 | 0 |
| Pres. dark red flesh | 5.3 | 26 | 6.5 | 9.5 | 0 |
| Price | 6.5 | 28 | -28 | 19 | 1 |
| Product uniformity | 4.8 | 14 | 2.5 | 2 | -3 |
| Shelf life frozen | 4.7 | 5 | 0 | 0 | 0 |
| Shelf life chilled u. | 6.7 | 28 | 14 | 18 | 0 |
| Size and dimensions | 5 | 8 | 4 | 6 | 4.5 |
| Supply availability | 5.5 | 22 | 0 | 10.5 | -10.5 |
| Texture | 4.5 | 12 | 3 | 12 | 3 |
| TOTAL | 87.8 | 312 | 14.5 | 153.5 | -46.5 |

Note: "Pres." indicates presence and "u." indicates unpacked.

(Cont. Table 6)

| | | Albacore Loins | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| Attribute | Mean score | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Belly meat | 4.9 | 5.3 | 5.2 | 10.3 | -5.5 |
| Bones present | 5.2 | 20.8 | -5.3 | 13.3 | -2.8 |
| Bruising/blood spots | 6.1 | 24.5 | -4.8 | 20.8 | -1.8 |
| Cuts and tears | 5.2 | 15.9 | 2.6 | 19.1 | -4.4 |
| Flavor | 6.7 | 16 | 11 | 21.4 | -13.5 |
| Flesh color | 5.7 | 21.8 | 13.9 | 11.9 | 6.4 |
| Glazing | 5.2 | 12.5 | -4 | 12.6 | -9.6 |
| Market support | 4.8 | 18.5 | 3.3 | 7.4 | 4.6 |
| Odor (thawed) | 6.4 | 25.3 | -8.9 | 21.2 | -1.7 |
| Packaging | 4.9 | 17.9 | 7.8 | 14.7 | -1.4 |
| Pres. dark red flesh | 6.3 | 12.4 | 5.6 | 12.2 | 2.5 |
| Price | 4.7 | 12.5 | -7.6 | 22.1 | 6.4 |
| Product uniformity | 5.7 | 16.9 | 4.3 | 18.4 | 7.2 |
| Shelf life frozen | 5.5 | 8.3 | 4.8 | 4.4 | 0 |
| Shelf life chi.p.t. | 5.8 | 11.8 | 8.7 | 14.7 | 2.3 |
| Shelf life chi.u.t. | 5.3 | 10.2 | 2.5 | 12.4 | 5 |
| Supply availability | 5.1 | 17.3 | 11.9 | 17.6 | 8.2 |
| Texture | 6.3 | 18.9 | 5 | 20.2 | 9.2 |
| TOTAL | 99.8 | 286.8 | 56 | 274.7 | 11.1 |

Note: "Pres." indicates presence, "chi.p.t." indicates chilled packed thawed, and "chi.u.t." means chiled unpacked thawed.

(Cont. Table 6)

| | | Albacore Medallions | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| Attribute | Mean score | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Belly meat | 5.2 | 10 | -15 | 1.3 | -2.2 |
| Bruising/blood spots | 6.9 | 28 | -21 | 27.3 | -19.7 |
| Dimensions | 5.4 | 12 | 4 | 11.2 | 1.8 |
| Flavor | 6.9 | 12 | 6 | 18.7 | -8.8 |
| Flesh color | 6.7 | 18 | -24 | 19.3 | 17.2 |
| Glazing | 6.1 | 14 | -14 | 7 | 0 |
| Market support | 5.1 | 6 | 0 | 15.3 | -2.2 |
| Odor (thawed) | 6.6 | 24 | -6 | 25.7 | -11.3 |
| Packaging | 5.3 | 0 | 0 | 17.8 | 16 |
| Pres. dark red flesh | 6.6 | 7 | -7 | 23.7 | 4.2 |
| Price | 5.4 | 24 | 18 | 21 | 15.7 |
| Product uniformity | 5.7 | 10 | 0 | 10.5 | 9.3 |
| Shelf life frozen | 6 | 24 | 6 | 18.5 | 14.2 |
| Shelf life t.p. | 6.2 | 28 | 7 | 18.7 | 18 |
| Shelf life t.u. | 6.2 | 24 | 7 | 13.5 | 6.6 |
| Supply availability | 5.4 | 28 | 7 | 18 | 1.7 |
| Texture | 6.6 | 28 | 7 | 23.8 | 10.5 |
| Thickness | 5.4 | 10 | -5 | 17.8 | 4.8 |
| TOTAL | 107.7 | 307 | -30 | 309.1 | 75.8 |

Note: "Pres." indicates presence, "t.p." indicates thawed packed, and "t.u." means thawed unpacked.

(Cont. Table 6)

| | | Albacore Steaks | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| Attribute | Mean score | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Belly meat | 5.1 | 28 | -7 | 10.8 | 8.2 |
| Bruising/blood spots | 6.7 | 26 | -6 | 27.2 | 3.5 |
| Dimensions | 6 | 10 | 7.5 | 9.8 | 8.4 |
| Flavor | 6.6 | 15 | 4.5 | 21.4 | 7.3 |
| Flesh color | 6.1 | 13 | 0 | 25.2 | 2.3 |
| Glazing | 6 | 14 | 0 | 17.5 | 2.3 |
| Market support | 4.9 | 7 | 3 | 19.6 | 12.8 |
| Odor (thawed) | 6.6 | 22 | -16 | 28 | -14 |
| Packaging | 5.4 | 20 | 17.5 | 22.5 | 9 |
| Price | 6.6 | 26 | -22.5 | 24.5 | 7 |
| Product uniformity | 6 | 24 | -12 | 21 | 9.8 |
| Shelf life frozen | 4.6 | 22 | 16 | 15.8 | 10.3 |
| Shelf life ch.p.t. | 5.7 | 3 | -12 | 18.2 | 14.3 |
| Shelf life ch.u.t. | 5.9 | n/a | n/a | 16.8 | 10.5 |
| Skin | 6.5 | 16 | 0 | 10.5 | 8 |
| Supply availability | 5.4 | 16 | 8 | 23.2 | 13 |
| Texture | 6 | 11.5 | 3.5 | 26.4 | 12 |
| Thickness | 6.4 | 14 | 3.5 | 20.2 | 13.3 |
| TOTAL | 106.5 | 287.5 | -12 | 358.6 | 138 |

Note: "ch.p.t." indicates chilled packed thawed, "ch.u.t." means chilled unpacked thawed.

(Cont. Table 6)

| | | Hot Smoked Albacore | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| Attribute | Mean score | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Color | 5.8 | 6 | 0 | 4.5 | 3.3 |
| Marinade intensity | 4.8 | 12 | -12 | 12 | 5 |
| Market support | 4.8 | 24 | 12 | 12.5 | -0.5 |
| Moistness | 5.2 | 18 | 12 | 14.8 | 3 |
| Packaging | 5.8 | n/a | n/a | 20.8 | 4.3 |
| Price | 5.2 | 4 | 0 | 19.3 | 3.8 |
| Product uniformity | 5 | 12 | -12 | 18.5 | 14.5 |
| Product size | 5 | 24 | 6 | 13.7 | 7 |
| Shelf life frozen | 4.6 | 28 | 0 | 14.3 | 9.8 |
| Shelf life t.u. | 5 | 20 | 10 | 3.5 | 0 |
| Shelf life t.v. | 4.6 | -16 | -16 | 16.3 | 7 |
| Supply availability | 5 | 10 | 0 | 18.8 | 14.5 |
| Texture | 4.8 | 16 | -16 | 16.5 | 13 |
| Type of smoke | 4.2 | n/a | n/a | 8.5 | 4.8 |
| TOTAL | 69.8 | 158 | -16 | 194 | 89.5 |

Note: "t.u" indicates thawed unpacked, "t.v." means thawed vacuumed.

(Cont. Table 6)

| Attribute | Mean score | Albacore Lox | | | |
|---|---|---|---|---|---|
| | | First Receiver | | Second Receiver | |
| | | Highest mean score | Second highest mean score | Highest mean score | Second highest mean score |
| Color | 6.1 | 13.3 | 2 | 15.8 | 5 |
| Coloring (dye) | 5 | 4 | -9 | 16.4 | 8.4 |
| Flavor | 6.9 | 9.3 | 0 | 25.2 | 4 |
| Market support | 5.6 | 21.3 | 8 | 17 | -2 |
| Oil content | 4.9 | 6.7 | 6 | 9.2 | 7 |
| Package | 5.4 | 17 | 8.3 | 15.5 | 11.7 |
| Packaging | 5.1 | 6.3 | 0 | 9.2 | 4.5 |
| Price | 6.2 | 18.7 | 1.7 | 20.7 | 8.5 |
| Product uniformity | 5.9 | 22.7 | 3.3 | 21.5 | 4.8 |
| Salt content | 4.2 | 8 | 5.3 | 11.5 | 9.3 |
| Shelf life frozen | 5.8 | 19.3 | 11.3 | 13.7 | 13.5 |
| Shelf life t.p.ch. | 6 | 12 | 9 | 13.5 | 9.8 |
| Shelf life t.u.ch. | 5 | 18 | 11 | 18.5 | 12 |
| Slice dimensions | 4.9 | 9.3 | 8 | 20 | 15.2 |
| Slice thickness | 5.1 | 10.3 | 6.3 | 21.5 | 16.5 |
| Slice/pakage | 3.7 | 7.3 | 6.7 | 9.5 | 6.7 |
| Supply availability | 5.8 | 18.7 | 10.3 | 20.7 | -1.5 |
| Texture | 6.2 | 13 | 5.3 | 15 | 6.2 |
| TOTAL | 97.8 | 235.2 | 93.5 | 294.4 | 139.6 |

Note: "t.p.chi." indicates thawed packed chilled, and "t.u.ch." indicates thawed unpacked chiled.

Table 7. Conjoint analysis results of demand models for whole albacore, low-value added albacore products, high value added albacore products, and albacore loins.

| Variable | Whole albacore | Low-value added albacore products | Albacore loins | High-value added albacore products |
|---|---|---|---|---|
| INTERCEPT | 7048.2 [a] | 421.2 | 370.87 | 1610.12 |
| | 1090.29 [b] | 127.354 | 941.404 | 688.404 |
| | 6.4650 [c] | 3.3070 | 0.3940 | 2.3390 |
| | 0.0001 [d] | 0.0013 | 0.6943 | 0.0216 |
| PRICE | -282.4 | -93.5 | 17.13 | -52.453 |
| | 198.646 | 32.4898 | 238.480 | 82.239 |
| | -1.4910 | -2.8770 | 0.0720 | -0.6380 |
| | 0.1393 | 0.0048 | 0.9428 | 0.5252 |
| PRODUCT | -532.3 | -4.340 | -117.54 | 146.76 |
| | 446.91 | 90.2599 | 646.230 | 352.340 |
| | -1.1910 | -0.0480 | -0.1820 | 0.4170 |
| | 0.2365 | 0.9617 | 0.8560 | 0.6780 |
| QUALITY | -274.4 | -0.258 | -95.47 | 101.02 |
| | 316.288 | 65.0889 | 465.503 | 354.462 |
| | -0.8670 | -0.0040 | -0.2050 | 0.2850 |
| | 0.3878 | 0.9968 | 0.8378 | 0.7763 |

| Variable | Whole albacore | Low-value added albacore products | Albacore loins | High-value added albacore products |
|---|---|---|---|---|
| SAFETY | 360.9 | 1.2871 | 171.79 | 121.55 |
| | 313.949 | 63.6301 | 454.674 | 308.513 |
| | 1.1490 | 0.0200 | 0.3780 | 0.3940 |
| | 0.2532 | 0.9839 | 0.7062 | 0.6945 |
| WSALER | 6207.9 | -99.089 | 6863.83 | 2031.59 |
| | 589.525 | 188.866 | 1202.764 | 1084.153 |
| | 10.5300 | -0.5250 | 5.7070 | 1.8740 |
| | 0.0001 | 0.6008 | 0.0001 | 0.0643 |
| REST | -2745.4 | -99.280 | 1795.64 | -2378.46 |
| | 498.885 | 84.3463 | 675.80 | 476.045 |
| | -5.5030 | -1.1770 | 2.6570 | -4.9960 |
| | 0.0001 | 0.2416 | 0.0089 | 0.0001 |
| EXPTUNA | -726.7 | -43.701 | -2704.46 | -5649.40 |
| | 426.548 | 73.1318 | 593.089 | 850.166 |
| | -1.7040 | -0.5980 | -4.5600 | -6.6450 |
| | 0.0916 | 0.5513 | 0.0001 | 0.0001 |
| EXPALBAC | -2643.3 | N/A | -862.24 | 776.3 |
| | 333.0423 | N/A | 779.488 | 684.881 |
| | -7.9370 | N/A | -1.1060 | 1.1340 |
| | 0.0001 | N/A | 0.2708 | 0.2601 |

| Variable | Whole albacore | Low-value added albacore products | Albacore loins | High-value added albacore products |
|---|---|---|---|---|
| RANKALB | -2859.9 | -63.988 | 2493.48 | -2474.6 |
| | 767.425 | 79.7681 | 1203.007 | 517.339 |
| | -3.7270 | -0.8020 | 2.0730 | -4.7830 |
| | 0.0003 | 0.4241 | 0.0403 | 0.0001 |
| EASTZONE | -995.3 | 29.883 | -81.67 | 2795.81 |
| | 986.930 | 73.8621 | 684.583 | 587.737 |
| | -1.0080 | 0.4050 | -0.1190 | 4.7570 |
| | 0.3157 | 0.6865 | 0.9052 | 0.0001 |
| WESTZONE | -3123.1 | 9.7489 | 709.81 | 4255.0 |
| | 916.134 | 79.8139 | 576.909 | 521.250 |
| | -3.4090 | 0.1220 | 1.2300 | 8.1630 |
| | 0.0010 | 0.9030 | 0.2209 | 0.0001 |
| OREGON | -3385.4 | 2966.79 | -2910.01 | -5734.7 |
| | 471.750 | 160.4627 | 933.177 | 898.911 |
| | -7.1760 | 18.4890 | -3.1180 | -6.3800 |
| | 0.0001 | 0.0001 | 0.0023 | 0.0001 |
| PRICEWH | -1553.3 | -93.46 | -1141.3 | -391.97 |
| | 324.969 | 32.489 | 353.156 | 165.856 |
| | -4.7800 | -2.8770 | -3.2320 | -2.3630 |
| | 0.0001 | 0.0048 | 0.0016 | 0.0203 |
| R-square | 0.8528 | 0.8669 | 0.4426 | 0.6555 |

NOTES:

1) Heteroskedasticity corrected using weighted least squares method

2) [a] Coefficient
   [b] Standard error
   [c] t-ratio
   [d] p-value

3) N/A = Data not available, when variable was introduced there was multicollinearity (model was not full rank).

4) Low-value added albacore products = chunks, medallions, and steaks

5) High-value added albacore products = hot smoked and lox

Table 8. Tobit analysis results of profitability models for whole albacore, low-value added and high-value added albacore products, and albacore loins.

| Variable | Whole albacore | Low-value added albacore products | Albacore loins | High-value added albacore products |
|---|---|---|---|---|
| INTERCEPT | -0.04277 [a] | 3.2461 | 6.896 | 12.389 |
| | 3.048 [b] | 3.448 | 1.663 | 2.211 |
| | -0.0140 [c] | 0.941 | 4.146 | 5.604 |
| | 0.9888 [d] | 0.3465 | 0.00003 | 0.0000 |
| PRICE | -4.2335 | -1.3519 | -2.304 | -1.8775 |
| | 0.4396 | 0.4128 | 0.3474 | 0.2381 |
| | -9.6300 | -3.275 | -6.633 | -7.885 |
| | 0.00000 | 0.00106 | 0.00000 | 0.00000 |
| PRODUCT | 0.11779 | 0.37074 | 2.1900 | 1.3906 |
| | 0.8873 | 0.7744 | 0.7861 | 0.7286 |
| | 0.1330 | 0.479 | 2.786 | 1.909 |
| | 0.89439 | 0.63214 | 0.00534 | 0.05631 |
| QUALITY | 0.84413 | 0.98222 | 0.43635 | -0.44642 |
| | 0.8676 | 0.8454 | 0.7057 | 0.723 |
| | 0.9730 | 1.162 | 0.618 | -0.617 |
| | 0.33057 | 0.24529 | 0.53639 | 0.53696 |

| Variable | Whole albacore | Low-value added albacore products | Albacore loins | High-value added albacore products |
|---|---|---|---|---|
| SAFETY | 1.6573 | -0.08759 | 0.18301 | 1.2484 |
| | 0.8836 | 0.8283 | 0.6959 | 0.6614 |
| | 1.8790 | -0.106 | 0.263 | 1.888 |
| | 0.06071 | 0.91578 | 0.79256 | 0.05908 |
| WSALER | 1.7542 | 15.453 | -0.15033 | 6.0152 |
| | 5.005 | 4.091 | 2.261 | 4.453 |
| | 0.3510 | 3.777 | -0.059 | 1.351 |
| | 0.72594 | 0.00016 | 0.95319 | 0.17677 |
| REST | 19.660 | 5.6527 | 4.8311 | 5.0796 |
| | 1.997 | 3.207 | 1.098 | 1.696 |
| | 9.8470 | 1.763 | 4.402 | 2.995 |
| | 0.00000 | 0.07796 | 0.00001 | 0.00274 |
| EXPTUNA | -8.2944 | -0.67794 | 1.5449 | 0.50574 |
| | 1.625 | 0.9677 | 1.032 | 2.889 |
| | -5.1030 | -0.701 | 1.498 | 0.175 |
| | 0.00000 | 0.48359 | 0.13425 | 0.86101 |
| EXPALBAC | 3.6464 | n/a | 0.09416 | 0.1069 |
| | 1.569 | n/a | 1.759 | 1.952 |
| | 2.3220 | n/a | 0.054 | 0.055 |
| | 0.02023 | n/a | 0.9573 | 0.95632 |

| Variable | Whole albacore | Low-value added albacore products | Albacore loins | High-value added albacore products |
|---|---|---|---|---|
| RANKALB | 20.624 | -3.2306 | 2.3995 | 1.5033 |
| | 2.049 | 2.394 | 2.413 | 1.698 |
| | 10.0650 | -1.349 | 0.944 | 0.885 |
| | 0.00000 | 0.17722 | 0.3200 | 0.37602 |
| EASTZONE | 11.746 | 3.6404 | -2.8799 | 1.676 |
| | 2.244 | 1.048 | 0.901 | 1.63 |
| | 5.2340 | 3.474 | -3.196 | 1.028 |
| | 0.00000 | 0.00051 | 0.00139 | 0.30383 |
| WESTZONE | 10.0200 | 1.7704 | 1.8665 | 0.54398 |
| | 2.418 | 1.056 | 0.953 | 1.376 |
| | 4.1440 | 1.676 | 1.959 | 0.395 |
| | 0.00003 | 0.09366 | 0.05017 | 0.69263 |
| OREGON | 14.5670 | 9.1757 | 2.7432 | 6.7286 |
| | 3.565 | 4.751 | 2.559 | 5.096 |
| | 4.0860 | 1.931 | 1.072 | 1.32 |
| | 0.00004 | 0.05346 | 0.28379 | 0.18668 |
| PRICEWH | -1.2098 | -2.6663 | -0.40005 | -0.26455 |
| | 1.585 | 0.6722 | 0.5931 | 0.4728 |
| | -0.7630 | -3.967 | -0.675 | -0.56 |
| | 0.44532 | 0.00007 | 0.49997 | 0.57577 |
| R-square | 0.2190 | 0.1420 | 0.1379 | 0.1721 |

NOTES:

1) Heteroskedasticity corrected using LIMDEP command

2) [a] Coefficient
   [b] Standard error
   [c] t-ratio
   [d] p-value

3) R-square = pseudo R-square

4) Low-value added albacore products = chunks, medallions, and steaks

5) High-value added albacore products = hot smoked and lox

# Appendix C

# ALBACORE SURVEY

## I. VERBAL SECTION A. ALBACORE AND TUNA BACKGROUND.

**1. What is your level of commercial experience in handling tuna products?**

a) Highly experienced  b) Some experience  c) No experience [skip to question 4]

**1.a. Overall, how would you rate the tunas relative to other seafood products?**

a) Above average (go to Q. 1.b.)  b) Average (go to Q.2)  c) Below average (go to Q.1.b)

**1.b. Why "above" or "below" average?**
[INTERVIEWER: If necessary prompt with regard to (1) safety, (2) quality, (3) demand, (4) supply, and (5) future potential]

INTERVIEWER-CIRCLE ONE

A LOT OF PROMPTING

MODERATE PROMPTING

LOW PROMPTING

**2. How would you rate your level of experience in handling albacore?**

a) Highly experienced  b) Some experience  c) No experience

**2.a. Overall how would you rate albacore relative to other tunas?**

a) Above average (go to Q.2.b.)  b) Average (go to Q.3.)  c) Below average (go to Q.2.b.)

**2.b. Why did you choose the answer you did?**
[INTERVIEWER: If necessary prompt with respect to (1) quality, (2) demand, (3) supply availability, (4) and future potential of albacore]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**3. Compared to the total annual volume of tuna which your firm handles, what is the relative percentage of the following types of tuna?**
[INTERVIEWER: Prompt "For example if you firm handles 100,000 lb. of tuna and albacore represents 10,000 lb. then its relative volume would be 10%]

a) ALBACORE _____ %

b) BIGEYE TUNA _____ %

c) BLUEFIN TUNA _____ %

d) YELLOWFIN TUNA _____ %

g) OTHER _____ %

h) DON'T KNOW _____ %

**3.a. What is the primary reason that _____ is your largest volume of tuna?**

**3.b. Compared to the total annual volume of all seafood which your firm handles, what is the relative proportion of tuna _____ ?**

**4. When purchasing tuna or tuna-like fish (i.e. swordfish), are you concerned about contaminants or other safety problems?**

a) Yes (go to Q.4.a.) b) No

**4.a Why?**
[INTERVIEWER: Only if necessary prompt the following sources (a) heavy metals (i.e. lead and mercury), (b) bacteria (seafood contaminated with bacteria from the package and the fish itself), and (c) scombroid poisoning (caused by eating fish, i.e. tuna, mackerel and skipjack, that have been improperly handled or stored)]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**5. What is the primary product form of non-canned tuna that your firm handles? __**

_____

[INTERVIEWER: Circle the product form and whether it is unfrozen or frozen, bone in or bone out]

**5.a Is it fresh or frozen?** Fresh Frozen

**5.b. Why does your firm primarily handle this product form? i.e., that is what is its relative advantages compared to other product forms.**

[INTERVIEWER: Prompt if necessary ....]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**6. When purchasing and selling tuna, how important is the "Dolphin-Free" tuna label?**

a) Very important b) Somewhat important c) Not important

[INTERVIEWER: Prompt for why]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

## I. VERBAL SECTION B. PRESENTATION OF ALBACORE PRODUCTS AND THEIR OVERALL EVALUATION.

**Present: Frozen chunks, Frozen loin, Frozen steak, Frozen medallions, Hot smoked, Loaf, Lox, Whole (picture), and Sashimi (picture)**

**(A) Visual evaluation.**
[INTERVIEWER: First ask the respondent to look at all the products. If they have any questions feel free to ask. Then ask to discuss and evaluate the products given their company's needs and interests]

**Assuming that you could obtain these product forms at competitive prices, please indicate your degree of interest in each product.**

| | | | |
|---|---|---|---|
| **Frozen chunks** | No interest | Moderate interest | High interest |
| **Frozen medallions** | No interest | Moderate interest | High interest |
| **Frozen loin** | No interest | Moderate interest | High interest |
| **Frozen steak** | No interest | Moderate interest | High interest |
| **Hot smoked** | No interest | Moderate interest | High interest |
| **Loaf** | No interest | Moderate interest | High interest |
| **Lox** | No interest | Moderate interest | High interest |
| **Frozen Whole (picture)** | No interest | Moderate interest | High interest |
| **Sashimi** | No interest | Moderate interest | High interest |

**Among those products that you rated "high interest," which one do you think has the greatest potential for your firm and why?**
[Interviewer: Prompt flesh color (too pale, right color, too dark); portion size (too small, right size, too big); overall appearance (very unappealing, indifferent ,very appealing); and any other issue or characteristic]

Flesh color (too pale, right color, too dark);
Portion size (too small, right size, too big);
Overall appearance (very unappealing, indifferent ,very appealing);

**What is a competitive range of prices you would expect to pay per lb. for _____ _____ ?**

[RESPONDENT'S MOST FAVORED ALBACORE] PRODUCT]

**Among those products that you rated "no interest," which one is the least interesting for you and why?**

[Interviewer: Prompt flesh color (too pale, right color, too dark); portion size (too small, right size, too big); overall appearance (very unappealing, indifferent ,very appealing); and any other issue or characteristic]

Flesh color (too pale, right color, too dark);
Portion size (too small, right size, too big);
Overall appearance (very unappealing, indifferent ,very appealing);

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**What is a competitive range of prices you would expect to pay per lb. for _____ _____ ?**

[RESPONDENTS' LEAST FAVORED ALBACORE PRODUCT]

**USE THE FOLLOWING SECTION ONLY IF THE RESPONDENT TASTES THE PRODUCTS.**

**(B) Taste evaluation of one (or more if possible) of the following albacore products: Loaf, lox, hot smoked, and chunks.** [Interviewer: circle the products which they sampled]

**Among the albacore products you tasted, which single product form would have the most potential for your firm?**

**Why this and not the others you sampled?** [Interviewer: ask the question only if they sampled more than one product]
[INTERVIEWER: If necessary prompt flesh color (too pale, right color, too dark); chewiness (slight, right chewiness, too chewy); flavor intensity (tasteless, right flavor, too intense); moistness (too dry, right moistness, too moist); portion size (too small, right size, too big); overall appearance (very unappealing, indifferent ,very appealing)]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**What is a competitive range of prices you might expect to pay per lb. for _____ _____ ?** [RESPONDENT'S FAVORED ALBACORE PRODUCT]
[Interviewer: ask this only if different than favored product from question in previous page]

**Would you change the evaluation (degree of interest) made at the beginning of this section for any of the samples that you tasted?** Yes No

**If yes, which products and to what degree?**

## I. VERBAL SECTION C. EVALUATION OF COOKING METHODS

INTERVIEWER: This section is **only** for restauranteurs .

**1. Which cooking method (s) do you prefer when preparing albacore (or other tuna species)?**

[Interviewer: circle only those which they prefer]

a) Microwave

b) Steam

c) Bake

d) Pan fry

e) Stir fry

f) Sashimi

g) Bronzing

h) N/A

**2. Why do you prefer this (these) cooking method(s)?**

[INTERVIEWER: Prompt ease handling the product, efficient use of time, efficient use of equipment, confidence in cooked product, consistency of the cooking method, and versatility of the method, form of product]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**3. For last year (1994) could you please estimate:**

a) Total revenue from sale of seafood meals? and, how many seafood meals were sold?

b) Total revenue from sale of beef meals? and, how many beef meals were sold?

c) Total revenue from sale of poultry meals? and, how many poultry meals were sold?

**4. a) What is your <u>most</u> expensive seafood meal and what is its menu price?**

**b) What is your <u>most</u> expensive beef meal and what is its menu price?**

**c) In terms of numbers of meals, approximately what is the ratio <u>seafood meals</u> ?**
**beef meals**

**I. VERBAL SECTION D. SUBSTITUTABILITY OF THE ALBACORE PRODUCT PREFERRED BY THE RESPONDENT.**

**What species and/or product form would you consider a close or moderate substitute of the albacore product you liked the most?**

**Why do you believe this product is a close or moderate substitute?**

## I. VERBAL SECTION E. QUESTIONS FOR CONJOINT ANALYSIS.

**1. Among the following, please select that response which best describes your belief about the need for improved safety control programs for albacore (or other tuna products).**

a) High need b) Moderate need c) No need d) Don't know

**2a. Please describe the features of a safety program that you would like to see for albacore or other tuna products:**
[INTERVIEWER: Ask Q.2. only if respondent answered "high need" or "moderate need."

Prompt handling, temperature, etc.]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**2.b Would you give the same or different response for the need for safety programs for seafood in general?**

a) Same b) Different

**2.c. If you chose "different," why the difference?**

**3. Do you know about the Hazard Analysis Critical Control Points (HACCP) seafood safety inspection program being developed by the FDA?**

a) Yes b) No [Interviewer: READ information to respondent]

**3.a Do you think this program will address your concerns about seafood safety for albacore?**

a) Yes b) No

**4. Among the following, please select the response that best describes your belief about the need for quality control programs for albacore (or other tuna)?**

a) High need b) Moderate need c) No need d) Don't know

**4.a. Why?**

**4.b. Would you select the same response for the need for quality programs for seafood in general?**

a) Same b) Different

**If different, why different?**

**5.a. Please select the type of quality control and programs you would like for controlling quality of albacore products:**
[INTERVIEWER: Ask this question only if they select "high" or "moderate need." Prompt inspection programs, time temperature monitoring programs, limited trips, expiration dates, etc.]

INTERVIEWER-CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

## I. VERBAL SECTION F. CONCLUDING QUESTIONS.

**1. Please indicate your position within your firm.**

a) Owner b) Manager c) Chef d) Purchaser e) Sales

f) OTHER_____
*(please specify)*

**2. How many years have you been in the seafood business?**

**3. Select the industry sector from which you PURCHASE the largest share of your tuna products.**

a) PRODUCER b) IMPORTER c) PROCESSOR d) EXPORTER

e) DISTRIBUTOR f) WHOLESALER g) RETAILER

h) OTHER _____
*(please specify)*

**4. Approximately, what are the annual revenues generated by your firm?**

a) 0 - $100,000 b) $100,000 - 1 million c) 1 - 10 million

d) 10 - 50 million e) 50 - 100 million f) More than 100 million

**5. Did you learn any new information about albacore during the survey?**
[INTERVIEWER: Prompt for what type of information]

INTERVIEWER CIRCLE 1

A LOT OF PROMPTING

MODERATE PROMPTING

NO PROMPTING

**6. Any thoughts about what the Oregon fishing industry needs to do to improve the marketing of albacore ?**

**7. Have we left out discussing any issue which you believe would be important for our success with producing and marketing albacore products?**

**REMEMBER TO ASK FOR BUSINESS CARD AND ADDRESS**

1. Interviewer's name _____

2. Name of the firm _____

3. Primary function performed by the firm _____

4. Your interview number _____

5. Date _____

6. Length of interview _____
(minutes)

7. Name of the person interviewed _____

8. Gender of interviewee _____ Age _____

9. Ethnic group _____

10. Resident Non-resident State _____

11. Did the respondent seem cooperative and interested in the survey?

| NOT INTERESTED | | | | | | | | VERY INTERESTED |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

| NOT COOPERATIVE | | | | | | | | VERY COOPERATIVE |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

12. How many times was the respondent interrupted during the survey? _____

13. Were others present during the survey? Yes No How many? _____

14. Did you think the interviewee was knowledgeable about tuna before the interview?

Very Some Little None

15. Did you think the interviewee was knowledgeable about albacore before the interview?

Very Some Little None

16. Overall, how would you rate the quality of the interview?

| LOW QUALITY | | | | | | | | HIGH QUALITY |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

17. Did the respondent read the promotional information before the survey began?
Yes No

**MASTER CARD FOR CONJOINT SECTION.**

**READ THE FOLLOWING INFORMATION BEFORE THE INTERVIEWEE STARTS WORKING WITH THE CONJOINT SECTION.**

**(A) QUALITY** pertains to product characteristics. e.g. color, odor, shelf life, etc.

**Traditional Quality Program:** Quality program provided by your seafood supplier, e.g. Fulton Fish Market.

**Proposed Quality Program:** Oregon's quality program

ESSENTIAL ELEMENTS OF OREGON'S QUALITY PROGRAM

1. Line caught and bled (not netted).

2. Chilled within 2 hours after capture.

3. Delivered within 5 days after capture to processor.

4. Delivered 5 days from capture to your doorstep.

5. Temperature and handling optimally controlled from capture to delivery to your doorstep.

**(B) SAFETY** pertains to minimizing health problems related to bacteria, histamine, heavy metals, scombroid poisoning, and contamination specifically.

**Traditional Safety Program:** The degree of safety which characterizes the albacore tuna products which you now purchase.

**Proposed FDA Mandated Safety Program:** Hazard Analysis Critical Control Points (HACCP).

You will be presented with 8 hypothetical uncooked albacore products. For each product you will be asked to state your preferences and the amount of product that you would consider purchasing.

Each product has a different combination of the following characteristics:

Product Characteristics: (1) Your highest rated characteristics, (2) Your second highest rated characteristics.

Price: (1) $ 5.00/lb., (2) $ 3.50/lb., (3) $ 2.00/lb.

Safety Program: (1) Traditional Safety Program, (2) Proposed FDA Mandated Program (HACCP)

Quality Program: (1) Traditional Quality Program, (2) Oregon's Quality Program

Please do not select the same score for any two products. To help in scoring you may wish to order the 8 cards from your most preferred to your least preferred on the score the desirability and quantity purchased.

**II. WRITTEN SECTION A. DESIGN OF ALBACORE PRODUCT.**

Please indicate the relative importance of each of the following attributes when purchasing FROZEN ALBACORE LOINS. Circle just one option and if the category is unknown or does not apply circle "N/A."
Note: the attributes are in alphabetical order.

| | | NOT IMPORTANT | | | | | | VERY IMPORTANT |
|---|---|---|---|---|---|---|---|---|
| BELLY MEAT (Meat with high fat content under belly) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| BONES PRESENT (One or more instances of bones) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| BRUISING/BLOOD SPOTS (Discoloration of skin as a result of bruising of whole fish/Red blotches on flesh in raw state) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| CUTS AND TEARS (One or more instances of cuts and tears) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| FLAVOR (Cooked flavor of product) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| FLESH COLOR (The color of the product when thawed, unsealed, and uncooked) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| GLAZING (Moisture retaining ice coat on the product surface when frozen unpacked) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| MARKET SUPPORT (Industry provides information, e.g. brochures, videos, etc.) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| ODOR (The odor of the product when thawed, unsealed, and uncooked) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| PACKAGING (State in which the product is packed, e.g. loose, single, etc.) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

NOT IMPORTANT VERY IMPORTANT

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PRICE | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| (The price the interviewee would pay per lb. to purchase product) | | | | | | | | |
| PRESENCE OF DARK RED FLESH (Dark muscle meat or "mudstripe" from the dorsal region of the fish, a natural feature of all tuna) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| PRODUCT UNIFORMITY (The level of uniformity to specifications) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| SHELF LIFE FROZEN (Period over which the product may be stored frozen without quality loss) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| SHELF LIFE CHILLED PACKED THAWED (Period over which the product may be stored sealed and chilled without quality loss) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| SHELF LIFE CHILLED UNPACKED THAWED (Period over which the product may be stored unsealed and chilled without quality loss) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| SUPPLY AVAILABILITY (Period of the year when it is possible to buy albacore) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| TEXTURE (Cooked product) | N/A | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Please select one score for each attribute level which corresponds to your relative level of desirability. If you find an attribute level which would make the product unacceptable no matter how desirable are other attributes, then circle the letter "U".

**Example : Product XYZ**

**STORAGE LIFE (THAWED)**

| | | VERY UNDESIRABLE | | | NEITHER STRONGLY DESIRED OR UNDESIRED | | | | | VERY DESIRABLE |
|---|---|---|---|---|---|---|---|---|---|---|
| a) 8 days | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 4 days | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) 2 days | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**BELLY MEAT**

| | | VERY UNDESIRABLE | | | NEITHER STRONGLY DESIRED OR UNDESIRED | | | | | VERY DESIRABLE |
|---|---|---|---|---|---|---|---|---|---|---|
| a) On | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| a) b) Off | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**BONES PRESENT**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) None | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 1-4 instances | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) More than 4 instances | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**BRUISING/BLOOD SPOTS**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) No blood spots | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 1-4 blood spots | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) More than 4 blood spots | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**CUTS AND TEARS**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) None | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 1-4 instances | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) More than 4 instances | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**FLAVOR**

| | | VERY UNDESIRABLE | | | NEITHER STRONGLY DESIRED OR UNDESIRED | | | | VERY DESIRABLE | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) Bland, no flavor | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Mild sweet taste | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) Flavor of "canned" albacore product | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**FLESH COLOR**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) Off white | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Yellow | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) Brown | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| d) Red | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**GLAZING**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) Glazed | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Unglazed | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**MARKET SUPPORT**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) High degree of market support provided | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Moderate degree of market support provided | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) No market support provided | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**ODOR (THAWED)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) No odor/fresh tuna odor | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Slight odor/ slight fishy smell | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) Strong odor/ very strong fishy odor | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**PACKAGING**

| | | VERY UNDESIRABLE | | | NEITHER STRONGLY DESIRED OR UNDESIRED | | | | VERY DESIRABLE |
|---|---|---|---|---|---|---|---|---|---|
| a) Vacuum packed | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Loose glazed | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) Composite lump (many loins) | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**PRESENCE OF DARK RED FLESH**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) None | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Present in less than 10% | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) Present in 10-25% | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**PRICE (FOB Seattle)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) $2.00/lb. | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) $4.00/lb. | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) $6.00/lb. | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| d) $8.00/lb. | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**PRODUCT UNIFORMITY**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) No more than 1% of product different that stated level of characteristics | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) No more than 5 % of product different that stated level of characteristics | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) No more than 15 % of product different that stated level of characteristics | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**SHELF LIFE FROZEN**

| | | VERY UNDESIRABLE | | | | NEITHER STRONGLY DESIRED OR UNDESIRED | | | | VERY DESIRABLE |
|---|---|---|---|---|---|---|---|---|---|---|
| a) 12 months | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 9 months | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) 6 months | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**SHELF LIFE CHILLED PACKED THAWED**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) 3 weeks | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 2 weeks | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) 1 week | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**SHELF LIFE CHILLED UNPACKED THAWED**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) 4 days | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 3 days | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) 2 days | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| d) 1 day | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**SUPPLY AVAILABILITY**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) 12 months/year | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) 9 months/year | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) 6 months/year | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**TEXTURE**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a) Very firm | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| b) Moderate firm | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| c) Soft | U | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |

**II. WRITTEN SECTION B. CONJOINT ANALYSIS.**

**MASTER CARD FOR CONJOINT SECTION.**

**READ THE FOLLOWING INFORMATION BEFORE THE INTERVIEWEE STARTS WORKING WITH THE CONJOINT SECTION.**

**(A) QUALITY** pertains to product characteristics. e.g. color, odor, shelf life, etc.

**Traditional Quality Program:** Quality program provided by your seafood supplier, e.g. Fulton Fish Market.

**Proposed Quality Program:** Oregon's quality program

ESSENTIAL ELEMENTS OF OREGON'S QUALITY PROGRAM

1. Line caught and bled (not netted).

2. Chilled within 2 hours after capture.

3. Delivered within 3 days after capture to processor.

4. Delivered 5 days from capture to your doorstep.

5. Temperature and handling optimally controlled from capture to delivery to your doorstep.

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**Traditional Safety Program:** The degree of safety which characterizes the albacore tuna products which you now purchase.

**Proposed FDA Mandated Safety Program:** Hazard Analysis Critical Control Points (HACCP).

You will be presented with 8 hypothetical uncooked albacore products. For each product you will be asked to state your preferences and the amount of product that you would consider purchasing.

Each product has a different combination of the following characteristics:

Product Characteristics: (1) Your highest rated characteristics, (2) Your second highest rated characteristics.

Price: (1) $ 5.00/lb., (2) $ 3.50/lb., (3) $ 2.00/lb.

Safety Program: (1) Traditional Safety Program, (2) Proposed FDA Mandated Program (HACCP)

Quality Program: (1) Traditional Quality Program, (2) Oregon's Quality Program

Please do not select the same score for any two products. To help in scoring you may wish to order the 8 cards from your most preferred to your least preferred on the score the desirability and quantity purchased.

Examples of two hypothetical albacore products:

**ALBACORE PRODUCT # 1**

| Product Characteristics | **Your Second Highest Rated Characteristics** |
|---|---|
| Price | **$5.00** |
| Quality Program | **Proposed Quality Program** |
| Safety Program | **Traditional Safety Program** |

Rate the degree of potential profitability of handling this product:

| HIGHLY UNPROFITABLE | | | | | | | | | | | BREAK EVEN | | | | | | | | | | HIGHLY PROFITABLE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -11 | -10 | -9 | -8 | -7 | -6 | -5 | 4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 | +5 | +6 | +7 | +8 | +9 | +10 | +11 |

How much of this product would you potentially purchase per week? _____.
PLEASE SPECIFY

---

**ALBACORE PRODUCT # 2**

| Product Characteristics | **Your Highest Rated Characteristics** |
|---|---|
| Price | **$5.00** |
| Quality Program | **Your Seafood Supplier's Quality Program** |
| Safety Program | **Proposed FDA Mandated Safety Program** |

Rate the degree of potential profitability of handling this product:

| HIGHLY UNPROFITABLE | | | | | | | | | | | BREAK EVEN | | | | | | | | | | HIGHLY PROFITABLE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -11 | -10 | -9 | -8 | -7 | -6 | -5 | 4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 | +5 | +6 | +7 | +8 | +9 | +10 | +11 |

How much of this product would you potentially purchase per week? _____.
PLEASE SPECIFY

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